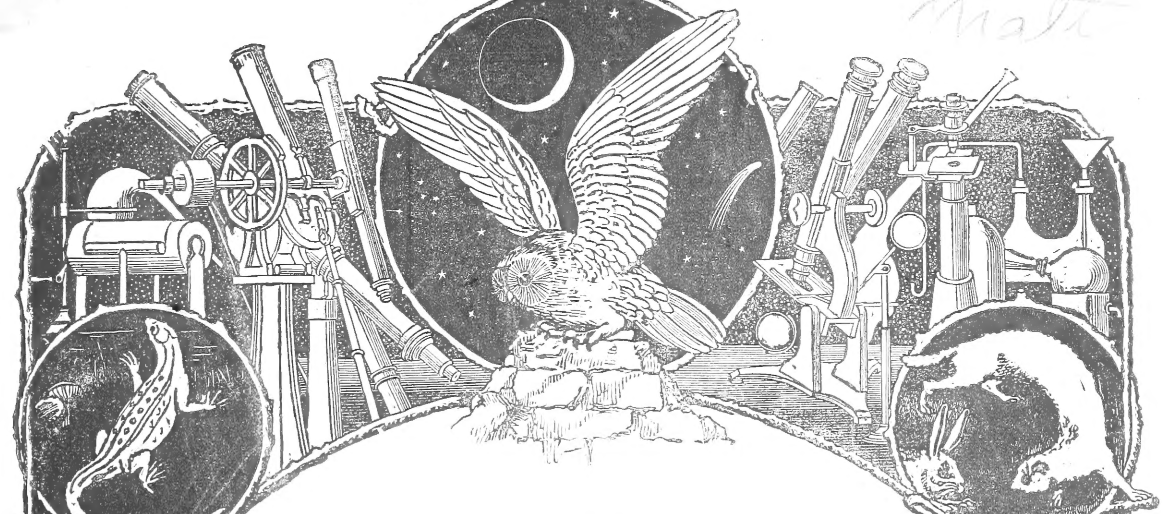

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SCIENCE-GOSSIP

An Illustrated Monthly Record of

NATURE, COUNTRY-LORE AND APPLIED SCIENCE

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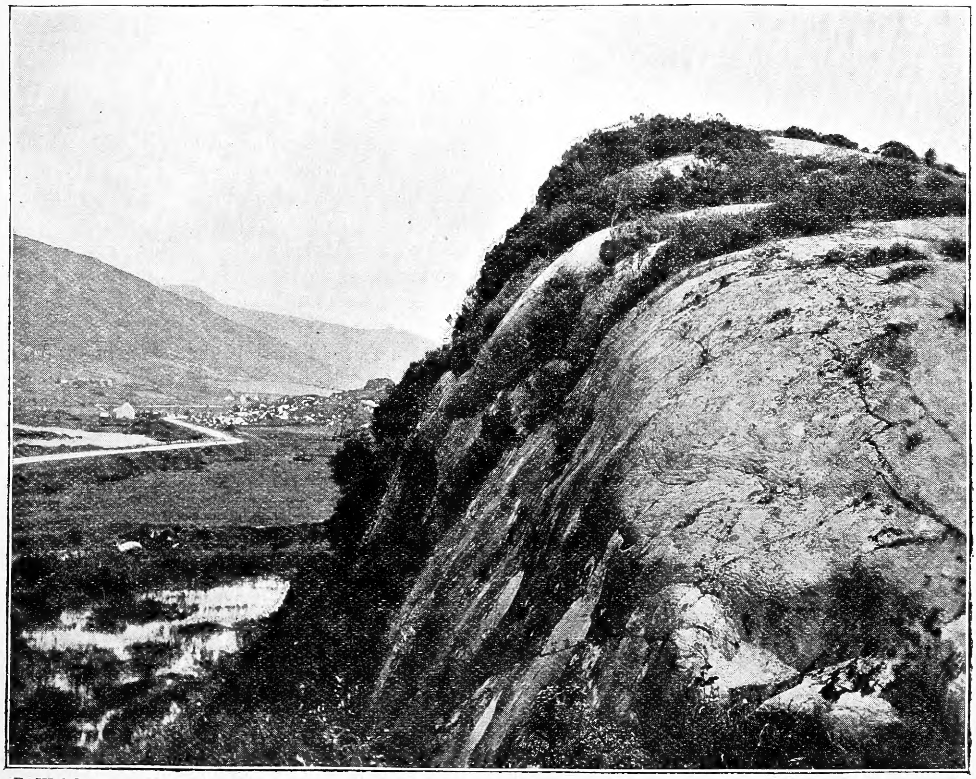
NATURAL SCIENCE IN IRELAND.

THE study of natural history in Ireland has always been more or less intermittent and largely influenced by the activity of one or a few leaders. There have been cycles of successful field-work directed by such men as Thompson, in the north, Edwin Birchall, from Dublin, and, to a lesser extent, by others; but the intervals of apathy are even more remarkable, considering the splendid opportunities. Never, however, has there been such a period as the present in Ireland for systematic study of natural science, directed with so much ability by Messrs. Lloyd Praeger, Geo. H. Carpenter, Grenville Cole, and the spirits who organize the Irish Field Club Union excursions. These annual and other reunions of the lovers of nature in the Sister Isle do more than anything else to foster their interest in biology. They bring about a healthy emulation among the members, and afford opportunities that are most valuable for comparison of ideas and knowledge.



R. *Welch*] [*Belfast, Photo.*

ICE-ROUNDED BLUFF OF OLD RED SANDSTONE AT LOO BRIDGE.
(*From the Report of Kenmare Conference, Irish Naturalists' Union.*)

We have just received a special number of "The Irish Naturalist," the organ of the Field Club Union, which is entirely devoted to the report of the second triennial conference and excursion of the Union, held at Kenmare, from the 7th to 13th of July last. It is beautifully illustrated with reproductions of photographs and a diagram. Through the courtesy of the Editors we are enabled to present one of these to our readers, showing a fine example of ice-worn rock. The other pictures include two of strawberry trees (*Arbutus unedo*), Cloonee Lough, views on the Sheen and Kenmare rivers, Upper and Muckross Lakes, ice-worn rocks at Moll's Gap, two erratic blocks, a bank of Irish spurge (*Euphorbia hibernia*), the spotted slug of Kerry (*Geomalacus maculosus*), young caterpillars of peacock butterfly (*Vanessa io*) on nettle, nest of wood-ant (*Formica rufa*) at Killarney, and one of wood-spider (*Pisaura mirabilis*). The Report of the Conference and Excursions is given in nine special articles. The first is a "General Account," by Mr. R. Lloyd Praeger, B.E., M.R.I.A., the Hon. Secretary of the Irish Field Club Union. This records the daily work of the members and friends present, who, by the way, appear to have numbered nearly a hundred. The head-quarters was at the Southern Hotel, Kenmare, one of the four fine establishments recently erected on the Kerry coast. Here the whole party found ample accommodation, with private sitting-rooms set apart for preservation of specimens and other scientific work necessary each evening after the day's explorations. The other reports are by G. H. Carpenter, B.Sc., on Spiders; H. K. G. Cuthbert, on Hymenoptera; Hon. R. E. Dillon, on Lepidoptera; J. N. Hulbert, on Coleoptera and Hemiptera; R. Standen, on Mollusca; R. Ll. Praeger, on the Botany; and J. St. J. Philips, on the Geology. The weather was admirable for the botanists and entomologists, though the heat and dryness were unfavourable to the malacologists. Copies of this Report may be obtained from Eason and Son, Limited, Dublin, price sixpence each. It will be found useful to general readers or those desiring to visit Killarney and Kenmare.

J. T. C.

PERSISTENCE OF LOW FORMS OF LIFE.

By G. W. Bulman, M.A., B.Sc.

If every other difficulty were removed, Darwin's hypothesis of the origin of species would remain a logical impossibility without that continued accession of new life usually known as spontaneous generation. For, according to Darwin's views, the higher forms arise from the lower by a process of victory in the struggle for existence, in the course of which those which have not varied in a favourable way, perish. The new variety—the incipient species—lives down the parent type, and those which have varied in the wrong direction. It is thus obvious that by the time any higher species is formed the lower type from which it arose ought to have disappeared; and hence, unless there were a continual production of fresh forms of the lower organisms, such would in time cease to exist.

Lamarck recognized the logical necessity of such a constant production of lower organisms for his scheme of development, and adopted a belief in spontaneous generation, for which he had ample justification in the science of his day.

It seems no less a logical necessity for Darwinism. Professor Haeckel believes it to be so, and hence, like Lamarck, accepts the hypothesis of spontaneous generation, although the advanced science of to-day affords no grounds for such a belief. Weismann, too, whose brilliant powers of reasoning must be universally acknowledged, sees the necessity for it. "I admit," he writes (1), "that spontaneous generation, in spite of all vain efforts to demonstrate it, remains for me a logical necessity." Professor von Nägeli, the eminent botanist, whose recent death science deplores, did the same. All plants, he contended, would have become phanerogams by this time if the lower orders were not continually recruited by the development of the products of spontaneous generation. But as the *proof* of the spontaneous generation of even the lowest known organism was not—as he had previously thought possible—forthcoming, Professor von Nägeli was latterly led to push it back into the regions of the unknown. He believed that the organic beings produced by spontaneous generation were as much more simple than bacteria as these are than the highest plants and animals.

As to Darwin himself, there can be little doubt that he saw clearly the immense advantage, if not the necessity, of such a belief to his views, and would gladly have accepted it had his scientific conscience permitted. But Professor Tyndall's exhaustive experiments had declared against it, and so, in spite of Dr. Bastian's ponderous volume and elaborate reasoning on the subject, Darwin remained firm. That he had a hankering after the doctrine is shown by his letters after reading Dr. Bastian's work. Thus, to Mr. Wallace he wrote: "I should like to live to see Archebiosis proved true, for it would be a discovery of transcendent importance; or, if false, I should like to see it disproved, and the facts otherwise explained." Again, to Professor Haeckel: "I will at the same time send a paper which has interested me. . . . . . It contains a singular statement bearing on so-called spontaneous generation. I much wish this latter question could be settled, but I see no prospect of it. If it could be proved true, this would be most important to us" (2).

It is true that both Darwin and Wallace have explained how their hypothesis of natural selection can do without spontaneous generation; but their explanations can hardly be regarded as satisfactory. They have too much the air of "explaining away" to be accepted without suspicion. As to Darwin's, it is one of the most unsatisfactory specimens of reasoning to be found in the "Origin of

(1) "Essays on Heredity," English translation, 2nd ed. p. 34.

(2) "Life and Letters of Charles Darwin," iii. p. 169.

Species"; and the *reason* given for the *fact* of persistence of low forms is a reason why there should be no higher forms at all: if fully accepted it puts a stop to all progress. I will here give the explanation in full, and then examine it in detail. I have italicised parts of the following extract from the "Origin of Species" to call special attention to certain statements, and for convenience of reference have put letters to others in connection with the remarks which will follow.

"Why have not the more highly developed forms everywhere supplanted and exterminated the lower? Lamarck, who believed in an innate and inevitable tendency towards perfection in all organic beings, seems to have felt this difficulty so strongly that he was led to suppose that new and simple forms were continually being produced by spontaneous generation. I need hardly say that science in her present state does not countenance the belief that living creatures are now ever produced from inorganic matter. *On my theory the present existence of lowly organized productions offers no difficulty;* (*a*) for natural selection includes no necessary and universal law of advancement or development, it only takes advantage of such variations as arise and are beneficial to each creature under its complex relations of life. (*b*) And, it may be asked, what advantage, as far as we can see, would it be to an infusorial animalcule —to an intestinal worm, or even to an earthworm— to be highly organized? *If it were no advantage, these forms would be left by natural selection unimproved or but little improved, and might remain for indefinite ages in their present little advanced condition.* And geology tells us that some of the lowest forms, as infusoria and rhizopods, have remained for an enormous period in nearly their present state. But to suppose that most of the many now existing low forms have not in the least advanced since the first dawn of life would be rash; for every naturalist who has dissected some of the beings now ranked as very low in the scale, must have been struck with their really wondrous and beautiful organization. . . . . . . Although organization on the whole may have advanced and be advancing throughout the world, yet the scale will still present all degrees of perfection; (*c*) for the high advancement of certain whole classes, or of certain members of each class, does not at all necessarily lead to the extinction of those groups with which they do not enter into close competition. (*d*) In some cases, as we shall hereafter see, lowly organized forms seem to have been preserved to the present day from inhabiting peculiar or isolated stations, where they have been subjected to less severe competition, and where they have existed *in scanty numbers*, which, as already explained, retards the chance of favourable variations arising.

"Finally, I believe that lowly organized forms now exist in numbers throughout the world and in nearly every class, from various causes. (*e*) In some cases favourable variations may never have arisen for natural selection to act on and accumulate. In no case, probably, has time sufficed for the utmost possible amount of development. In some few cases there may have been what we must call retrogression of organization. (*f*) But the *main cause* lies in the circumstance that under *very simple conditions* of life a *high organization* would be of no service—possibly would be of actual disservice—as being of a more delicate nature, and more liable to be put out of order and thus injured."

(*a*) But is it true that Darwin's views do not imply the necessity of an advance from lower to higher forms? It has been shown that abundant variation is constantly taking place in all classes of organic beings; and there are no grounds for assuming that any species at the present day or in time past should be exempt from this law of variation. If variation is constantly going on, and the struggle for existence ever taking place, as supposed by Darwin, is it not *a necessary consequence* that there should be always, and under every condition of life, some of these variations better fitted to survive than others? If there is any truth in Darwin's hypothesis, ought not these to be constantly building up new races on the ruins of the unimproved individuals? When the problem is to account for the evolution of higher forms from lower, it is necessary to suppose the progress was, on the whole, towards higher organization. If Lamarckism implies "an innate and inevitable tendency towards perfection in all organic beings," Darwinism strives after the same goal of perfection in living organisms by a weeding out of the unfit, not less inevitable. Only, by the latter, the constant progress has to be attained without the "innate and inevitable *tendency*"; it must be by the victory of the higher forms in the struggle for existence which acts by life and death—the evolution of a new form entailing the destruction of that from which it is derived. (*b*) This question appears unanswerable, but it might equally be asked of any low forms of life at present existing, *some* of which, on Darwinian principles, must be supposed to be advancing; it might with equal propriety be asked of the lowly forms of the past—which are the hypothetical ancestors of the higher forms of the present. If the explanation is accepted as accounting for the persistence of low forms of life, it must also be accepted as a reason why no low form of life should ever become more highly organized on the principles of natural selection; for there is nothing in Darwin's explanation to show that it applies to certain low forms of life and not to others. There seems no reason to suppose, for example, that the "infusorial animalcule," the intestinal worm, or the earth-worm, are more specially fitted to their present conditions than other organisms; or that any others would be more likely to reap benefit from a higher organization than they actually possess. Neither are there any grounds for the belief that the organisms of past ages were less fitted to their surroundings than those of to-day, or more likely to benefit by a higher organization.

(*c*) This explains why existing low organisms continue to exist at the present, but does not account for their being left behind at that remote period of the past, when they had to struggle with the simple ancestors of existing higher forms, which, according to Darwinism, would then attain rank as new species by living down those which did not improve likewise. The question is not—why does not the mammal of to-day live down the amoeba with which it does not come into close competition, but why did not the amoeboid ancestor of the mammal by virtue of its advancing organization exterminate the ancestor of the present amoeba which was not improving?

(*d*) The plea of isolated stations and scanty numbers cannot be applied to low forms of life in general, for they are everywhere and exist in enormous numbers.

(*e*) It is surely strangely inconsistent with the spirit of Darwinism to believe that during the countless ages which have elapsed since the dawn of life upon the globe any race of organic beings can have lived without presenting variations which according to the hypothesis should have been preserved and accumulated. To put it plainly, why should one race of simple organisms have gone on varying generation after generation until the accumulated variations produced an elephant, while another, or a part of the same, simple race never even presented any favourable variations for natural selection to work upon? *Any* character which a given race possessed would, according to the hypothesis, vary in *degree*, and some of these variations ought to be better fitted than others for the battle of life. Time can scarcely enter as a factor in the problem when it is a question why one extremely simple form of life has by variation and survival of the fittest given rise to a monkey, while another in the *same* time has never got beyond its extreme simplicity.

(*f*) If we allow full force to the "main cause" alluded to in this sentence, a stop is put to all progress on the lines of Darwin's hypothesis. For going back to the beginning the conditions of life would—according to Darwin's views—be *very simple* for *all* organisms. "Looking to the dawn of life," he writes, "when all organic beings, as we may imagine, presented the simplest structure." These conditions of life only become more complex when the higher organisms came into existence. Thus, according to the above statement, it would be of no advantage to simple forms of life to become more highly organized *until higher forms come into existence* and make the conditions of life more complex. Hence no progress is possible: there is no motive power for advance until the higher forms exist; and these higher forms are themselves only produced by the advance of the lower. There is no *logical* impossibility in supposing that the tortoise supports the world; but what if the world has likewise to support the tortoise? The contrast ought not to be made between a "*very simple* condition of life" and a "*high* organization," but between a very simple condition of life and an organization *very little* less simple; for the advances in organization by which Darwinism proceeds are of the infinitesimal sort. It is difficult again, on Darwinian principles, to see how, if such small advances in organization occur among the spontaneous variations in successive generations, they should not be preserved and accumulated, since all the advance in organization which has taken place in animate nature is supposed to have conferred advantages at each step.

It is also difficult to understand why such advances should take place in certain races—as we must suppose they have done—and not in others: no reason is given for such a difference. Or, going back to the *one* simple form of life at the beginning, it is difficult to understand why a *part* of the race should advance in organization, and another part remain stationary.

Mr. Wallace's explanation is no more satisfactory; it can hardly be said to go to the root of the matter. The very manner in which the supposed objection is put seems to evade the point. "It may be asked," he says, "Why do any low forms continue to exist? Why have they not long since been improved and developed into higher forms?"

The question is rather: why were these low forms not lived down by those *now* advanced in the scale at the time when they had to struggle together? For on the principles of natural selection, a new species arises by living down the parent form and the unfavourable variations. The question is, not why some have not been improved, but why the unimproved have been allowed to exist by those which were improved; further, why, granting abundant variation and an intense struggle for existence, no effect should be produced on certain of the most lowly forms of life in the course of the countless ages since their first appearance on the earth; while on others, *not essentially different*, the effect of the *same forces* has been to convert a monad into a lion, an eagle, or an alligator. Mr. Wallace expressly states (3) in the passage in which he attempts to account for the persistence of low forms of life, that "species are continually undergoing modifications giving them some superiority over other species, or enabling them to occupy fresh places in nature." Such a statement might easily be taken to imply that all species must be advancing, yet it is the preface to the explanation why so many forms have been left behind in the battle of life. Mr. Wallace believes that some from among these very races which he thus complacently leaves behind have been improved, while he endeavours to show

(3) "Darwinism," p. 114.

there is no reason why they should be; for his arguments would apply equally to the ancestors of the improved forms as to the unimproved. The plea that these low forms will have few or no competitors will not hold, as already pointed out; for there is no place in nature where they will not have to struggle with forms in some degree higher than themselves; and, moreover, the struggle for existence is generally held to be more severe between individuals of a species, and between closely allied species, than between more distant ones.

"Earthworms," says Mr. Wallace, "are adapted to their mode of life better than they would be if more highly organized." It has been already shown that this argument would probably apply equally to every lowly organism which exists or has existed. It would, we may suppose, apply equally to our Darwinian ancestor—"an animal which breathed water, had a swim bladder, a great swimming-tail, an imperfect skull, and undoubtedly was a hermaphrodite"—which presumably was as well fitted for its aqueous life as the earthworm is for its terrestrial one. *Eohippus*, too, was probably as well adapted for its marsh as the modern horse is for the prairie, and showed as little probability of ever developing into anything else as does its supposed descendant. It may be said further, that if the earthworm were to become more highly organized it would adopt a different mode of life. For it is ever, according to Mr. Wallace's views, some spontaneous variation in the organism which lifts it on to a higher platform of existence, and to which its mode of life must be adapted.

If, then, the argument that the lower forms of life remain where they are, instead of leaving their low estate by means of spontaneous variations and the survival of the fittest, *because* it would be of no advantage to them to do so, be admitted, the great motive power of Darwinism is lost. Further, if through the countless ages of the past there has been no motive power to destroy or seriously modify *certain* lowly forms of life, where is the force required to evolve new species on the hypothesis of natural selection from other forms not essentially different?

My conclusion, then, is that Darwinism without spontaneous generation is unable to account satisfactorily for the persistence of low forms of life; and that the chief argument brought forward in explanation, *viz.*, that it would be of no advantage to a simple form to become more highly organized, is one which if admitted puts a stop to all development.

It is a curious reflection that if Darwinism without spontaneous generation be true, then the most lowly monad that exists is the product of the same forces, acting on the same material, during the same countless ages, as man himself!

29, *Queen's Terrace, Jesmond, Newcastle-on-Tyne.*

ARMATURE OF HELICOID LANDSHELLS
AND NEW FORMS OF PLECTOPYLIS.

By G. K. Gude, F.Z.S.

(*Continued from page* 115.)

PLECTOPYLIS *achatina* var. *infrafasciata* (1) (figs. 84*a-c*) is still darker than the variety *obesa*, being of a blackish or purplish-brown. Like that variety it is rounded in contour, but it is larger and more flattened; while the umbilicus is a little more shallow and the peristome more flattened and reflexed than in the type. The peristome is livid purplish in colour, the left margin being paler and the right margin a little inflected. A whitish or bluish-white band below reaches from the umbilical angulation to the lower suture. The armature is similar to that of the type, but the horizontal parietal fold near the lower suture is visible from the aperture and terminates close to the ridge. The specimen figured was received by me from Mr. Robert Cairns. Four specimens in the collection of Mr. E. L. Layard and one specimen in the McAndrew collection (the latter labelled "*Plectopylis refuga*") all belong to this form. The

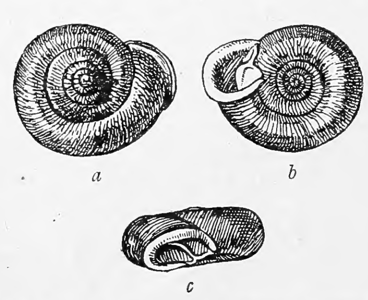


Fig. 84.—*Plectopylis achatina* var. *infrafasciata.*

(1) *Plectopylis achatina* var. *infrafasciata*, n. var. (figs. 84 *a-c*), differs from the type in being more rounded in contour, and in the last whorl not widening at the aperture; the umbilicus is more shallow and the peristome more flattened and reflexed; the right margin is a little depressed; the shell is blackish or purplish brown above, with a white or bluish white band below, reaching from the umbilical angulation to the lower suture; the peristome is purplish brown, the left margin being paler.—Major diameter, 22 millimetres; minor diameter, 18 millimetres; altitude, 8 millimetres.—Habitat, Limestone Rocks, Moulmain, Burma.—Type in my collection.

shell figured in Hanley and Theobald's "Conchologia Indica," t. 57, f. 8 and 9, and Martini und Chemnitz "Conchylien Cabinet" (2) i. t. 66, f. 28-30 (from Mergui, Burma), I also refer to this variety. A specimen measuring 21 millimetres in diameter is in the collection of Mr. Cairns, who also possesses four immature shells in various stages of growth, all showing sets of barriers similar to that of the immature *Plectopylis achatina* shown in fig. 81*a*.

Plectopylis achatina var. *venusta* (2) (figs. 85*a-c*) is smaller than any form of *P. achatina* I have seen. It is pale yellowish-white in colour, flammulated with chestnut above and at the sides. It resembles the variety *obesa* in the deeper umbilicus, the sloping underside and in the comparative height of the shell; the median parietal fold does not quite reach the apertural ridge as in that variety, and the lower horizontal parietal fold is not visible from the aperture; it resembles the type in the sudden widening of the last whorl. The peristome is livid brown, the right margin being a little depressed; the left

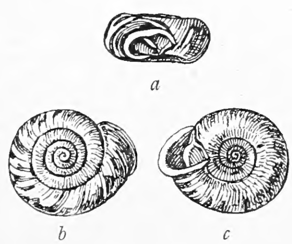


Fig. 85.—*Plectopylis achatina* var. *venusta*.

margin is paler. The specimen figured was received by me as *Plectopylis pachystoma* Theobald; but as I am not aware that this name was ever published, and as I have seen other shells so labelled, I consider it expedient to discard the name altogether. A specimen in the collection of Dr. von Möllendorff, likewise labelled *P. pachystoma*, I am unable to separate from the present variety, although it shows no flammulation and the peristome is white; in other respects it is identical.

Plectopylis achatina var. *castanea* (3) (figs. 86*a-c*) is darker than the other forms of *P. achatina*, except the variety *infrafasciata*, being of a blackish-brown above, a little paler below. It is, however, larger than that variety, and does not possess the white band below; the umbilicus is also much deeper, the shell being in that respect more like the variety *obesa*, which it also resembles in the sloping underside; the aperture is proportionately larger than in that variety. The spiral lines on the last two and a-half whorls are visible without

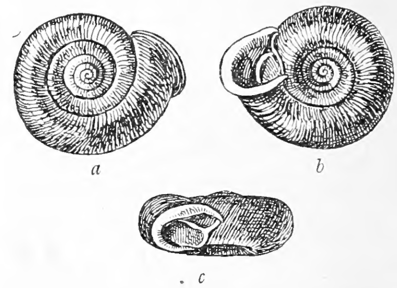


Fig. 86.—*Plectopylis achatina* var. *castanea*.

the aid of a lens. The specimen figured was received by me from Miss Linter.

Plectopylis achatina var. *breviplica* (4) (figs. 87*a-c*) has a much shallower umbilicus, and is thinner and more fragile than any other form of *P. achatina* known to me. It is somewhat like the variety *infrafasciata*, but it is devoid of the white band on the lower side; the last whorl also widens a little more than in that variety, but is less deflected, and

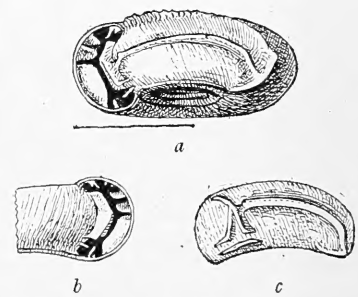


Fig. 87.—*Plectopylis achatina* var. *breviplica*.

(2) *Plectopylis achatina* var. *venusta*, n. var. (figs. 85*a-c*), differs from the type and the other varieties in being smaller. It resembles the variety *obesa* in the deeper umbilicus, in the sloping underside, in the comparative height of the shell, and in the median parietal fold not reaching the apertural ridge, but the last whorl widens more, as in the type. In colour it is pale yellowish-white, flammulated with chestnut above and at the side. The peristome is livid brown, the left margin paler, the right margin a little depressed.—Major diameter, 17 millimetres; minor diameter, 14 millimetres; altitude, 7 millimetres.—Habitat, Burma.—Type in my collection.

(3) *Plectopylis achatina* var. *castanea*, n. var. (figs. 86*a-c*), differs from the type in being smaller in diameter and proportionately higher; it is darker in colour, being blackish-brown above and a little paler below. It resembles the variety *obesa* in being more rounded in outline, in the last whorl not widening suddenly at the aperture, in the sloping underside, and in the median parietal fold not reaching quite to the apertural ridge; the last two and a-half whorls are more strongly decussated above and below than in any other form. An obsolete keel is visible at the periphery.—Major diameter, 21 millimeters; minor diameter, 19 millimetres; altitude, 8 millimetres.—Habitat, Burma.—Type in my collection.

(4) *Plectopylis achatina* var. *breviplica*, n. var. (figs. 87*a-c*), differs from the type and all the other known varieties by the much more shallow umbilicus. It resembles the variety *infrafasciata* in outline, but it is of a uniform dark brown, with a somewhat polished surface, and the last whorl widens more suddenly at the aperture. The basal horizontal parietal fold is very short, not extending on either side beyond the two lower arms of the main median fold; the first palatal horizontal fold is considerably more elevated than in the other forms, and is bilobed; the second and third horizontal folds are also more elevated, the latter fold has a short fold above its posterior portion; the vertical plate is also more elevated, and in place of the usual denticle posteriorly to its lower extremity is an elevated ridge, quite united to the plate.—Major diameter, 19 millimetres; minor diameter, 16 millimetres; altitude, 7 millimetres.—Habitat, Burma.—Type in Mr. Ponsonby's collection.

the aperture is more sloping from top to base; there are also important differences in the armature, the lower horizontal parietal fold being very short, not extending on either side beyond the two lower arms of the main fold (see fig. 87*c*, which shows part of the parietal wall with its folds). Of the palatal armature, the first, second, and third folds are more elevated; the first is bilobed, and above the posterior portion of the second occurs a very short additional fold. The vertical plate is also more elevated, and in place of the usual denticle posteriorly to its lower extremity is found an elevated ridge quite united to the plate. Fig. 87*a* shows the anterior and fig. 87*b* the posterior aspect of both armatures. The specimen figured is in the collection of Mr. Ponsonby.

(*To be continued.*)

ORIGIN OF SPECIES IN INSECTS.

By J. W. Tutt, F.E.S.

(*Concluded from page 112.*)

Climate Producing Useless Characters.

ROMANES considered that the actual causes which lead to the production of useless specific characters were climate, food, sexual selection and laws of growth. It may be well to examine these points from our position as entomologists. The influence of climate on Lepidoptera, and I have no doubt on other classes of insects, is undoubted. When the same species inhabits central Europe, the Alps at high altitudes, and the Polar regions at high latitudes, the forms from the various localities often exhibit marked differences, and those from high altitudes more or less tend to resemble those from high latitudes. These differences may be produced either by climate directly, or by a difference in the nutritious value of the food brought about by a difference of climate. According to Staudinger, the variety *aegidion* of *Plebeius argus* is confined to Lapland and the Swiss Alps. *Polyommatus eros* inhabits the Alps and Pyrenees; a large form known as var. *eroides* occurs in the plains of south-east Germany. The var. *polaris* of *Aglais urticae* is almost confined to the Polar regions. *Melitaea aurinia* has a small undersized Alpine variety known as *merope*, whilst *M. parthenie* has a similar form known as var. *varia*. *Ossianus* is a small Lapland variety of *Brenthis aphirape*, and *Brenthis selene* and *B. euphrosyne* have parallel Lapland forms known as *hela* and *fingal* respectively; *Coenonympha arcania* has an Alpine form known as *darwiniana*, and so on. We have the bright-red form of *Chrysophanus phlaeas* from northern Europe, the almost black form of the same species appearing in the summer in those countries washed by the Mediterranean. Yet, in neither race, is the character a very fixed one, nor the physiological change accompanying the change of colour one that is hereditary, for the breeding of the species from the dark form in more northern latitudes results at once in the production of specimens scarcely distinguishable from the normal form of the species occurring in our latitude. The difference, then, may be due to the rapidity of feeding up, so that the larvae do not get sufficient material for use; this, however, is unlikely. It may be due to the rapid metabolism of the tissues in the pupa, so that the normal pigment, if the brighter coloured pigment be considered normal, has not sufficient time to mature; or it may be that the pupa has not sufficient material at disposal to form the pigment matter. I take it that the second of these possibilities is the correct one. It seems to me that this change of colour being due to physiological causes, does not in any way affect the specific characters of the species, and what is true of this is true of all other Lepidoptera that vary under different climatic conditions.

When we turn to Mr. Merrifield's experiments, where, as far as possible, all other factors have been eliminated, we are much struck with the fact that the exposure of the pupa to a difference of temperature does, in some species, produce a marked difference in the imago. This difference, however, is not by any means identical even with species of the same brood, yet we may safely say that a general change in the same direction takes place, under given conditions, in the individuals of the same species, some individuals showing much, others comparatively little, change. The more extreme results, however, of these experiments have not been the production of useless specific characters, but have resulted in the production of atavic forms, often quite unlike any species now in existence. That these modifications take place only at the critical point of pigment formation Mr. Merrifield has, I think, abundantly proved; and that the changes are due to the effect of the high or low temperature on the energy of the pupa at the time of the formation of the pigment is, I think, certain. I am, therefore, inclined to consider that climate does not—except as (1) acting prejudicially or the reverse on insects through their food, making it stunted and less nutritious, and *vice versâ*, and thus leaving them with an insufficiency or excess of energy for the production of an imago of normal size and pigmentation, (2) causing less or more rapid metabolism of the pupal tissues during the period at which the imaginal tissues are being perfected —really affect any species of Lepidoptera at all. Certainly it does not do so in the direction of producing real structural modifications.

Food and Specific Characters.

When writing "Melanism and Melanochroism in British Lepidoptera," I stated that food could not produce changes in the colours of insects. I have long since retired from this untenable position, although unable to give, off-hand a single illustration from nature where food, without doubt, has caused a change in a species. Probably the stunted moorland forms of *Hypsipetes sordidata* and *Cidaria russata*, with which Mr. Porritt has made us acquainted, are due to the innutritious nature of their food. I am also aware that ill-fed larvae produce either dwarfed or ill-pigmented imagines, the larvae evidently not being strong enough, nor having reserve material and energy enough, to produce the normal coloration. All variations brought about by food, too, appear to act in this direction, *i.e.* by increasing or decreasing the amount of material available for wing formation and pigment, and, thus, variations produced by this means are those of size or colour. In no way can these be considered as hereditary, since they change with the substitution of a different food-plant with each brood, or even part of a brood, if it be separated. Hence these differences can in no way be considered as specific characters.

Sexual Selection in Lepidoptera.

I have already ("British Noctuae and their Varieties," vol. iii., p. 17) discussed sexual selection in its application to Lepidoptera and must confess that I am quite unable to subscribe either to the views of Wallace or Darwin, that females exert any real choice, or select the males with which they pair. There may be some little probability that sexual selection in a small degree occurs in butterflies, but I have seen a female *Colias edusa* paired whilst her wings have been limp, and among the Lycaenids one must be a poor field naturalist who has not seen wretched little males in copulation with large and well-developed females and *vice versâ*, whilst dozens of well-developed specimens are everywhere around. Among the larger moths the males will often pair with the females before their wings have fully expanded, the females most certainly having exerted no choice. Whatever influence sexual selection may have on the formation of specific characters in the higher animals, I do not think such influence exists in the Lepidoptera. Granted, however, the existence of sexual selection, then I fail to see how it tends to the development of specific characters, useful or useless. To me sexual selection appears only as another phase of the general principle of natural selection, and although I can see that the picking and choosing of the females may stamp a character already in existence in the males more markedly on the race, I fail to see how it can originate any new character for this selective process to act upon. That the females would, as a race, continue to pick males that possessed some mark that had ceased to be of service to the species is hardly conceivable.

Isolation fixes Characters.

I do not think that isolation can beget specific characters. There can be no doubt that it tends to fix, by natural selection, such characters as are already in process of settlement. The tendency to close interbreeding, the more constant character of the environment to which the species is subjected, and other similar causes, tend to define the characters more sharply when a species is strictly isolated from the ancestral form. I have already shown how isolation need not be a physical isolation, like the separation of an island from the adjacent continent, but that the emergence of closely allied species at different times of the year, by flying at different times of the day or night, or by being restricted to different food-plants of local habit, might be just as potent as separation by physical barriers.

Laws of Growth.

Nor can the laws of growth originate specific characters. The laws of growth, it appears to me, must be applied to actual existent parts of an organism, and until some nervous or other exciting cause has been stimulated to bring about a modification I do not see how the laws of growth can influence any structure or organ. It appears to be the case that only when other causes have brought about changes useful to the species these laws can have any action at all.

Summary of Effects.

It will be thus seen that I doubt entirely the power of climate, food, sexual selection, isolation and laws of growth to produce specific characters at all, whether useful or useless. The modification of parts necessary to bring about a new specific character cannot be originated, I venture to assume, by any of these phenomena. Climate may alter the pigments of Lepidoptera, the scale-structure, or the size of a specimen by its injurious (*i.e.* abnormal) action on the larva or pupa; but none of these alterations are hereditary. Food, according to its nutritious or innutritious value will produce large or small specimens ; but size alone is not a specific character. It generates no new modification of an existent organ. Sexual selection is, in Lepidoptera, I believe, practically an unknown quantity, and probably in some other families of organized beings the supposed action in this direction is much overrated. I fail, entirely, to see how either isolation or the laws of growth can originate a new structure, or modify an existent one *per se*, although both forces are valuable for the development of a modification, once it has taken place.

Utility of Specific Characters.

It must be evident to anyone who will logically consider the subject that, if the survival of the fittest be the one test by which species exist, and that all species have been brought about by a gradual and almost imperceptible transition from other species, the change which takes place and becomes fixed in the species, *i.e.* the specific character, and which separates it from its immediate ancestor, must be a change that will be useful to the species. Therefore, the presence of useless specific characters, so-called, is more likely to be due to our failure to understand their use, rather than to any likelihood of their actual uselessness. In no case that occurs to me do any local races of Lepidoptera exist in certain areas to the exclusion of the type—except in the one case of *Polyommatus astrarche* var. *artaxerxes*, which is almost restricted to certain localities in Scotland — without our being able at once to show that they are adaptations to environmental conditions, which make the differentiating features of the utmost use to the races exhibiting them. As these various local races have assumed their racial characters for purely utilitarian purposes, or are the result of conditions under which the normal type would cease to exist, so we may rest assured the characters retained by various species have been those which have remained useful to the species. The characters which now distinguish them as species most probably originated as racial peculiarities because they were of use, and enabled them to win in the struggle for existence which they were obliged to wage against the various species by which they were everywhere surrounded. So far as an intimate study of our lepidopterous fauna allows me to judge, I should say that certainly every specific character is or has been correlated with a character useful to the species.

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BRITISH INFUSORIA.

By E. H. J. Schuster, F.Z.S.

(*Continued from page* 110.)

Part IV.—Ciliata Heterotricha.

The order Heterotricha includes such forms as are covered over with an even coating of cilia and have besides a specially developed adoral band. No distinction between the ciliation of the dorsal and ventral surfaces can be observed.

Family Bursariadae is characterized thus in Mr. Saville Kent's "Manual of the Infusoria": "Animalcules free-swimming ; persistent in shape; more or less oval, often considerably flattened; peristome field excavate, extending backwards obliquely from the frontal border ; wide anteriorly ; the oral aperture situated at the posterior and narrowest confines of this region, frequently followed by a well-developed pharyngeal passage ; larger adoral cilia developed in a straight or oblique line along the left hand margin of the peristome only, not encircling the mouth in a spiral manner ; anal aperture posteriorly situated ; no undulating membrane."

Bursaria truncatella Müller.—The body of this animal is persistent in shape, though flexible. It is moderately long and bag-shaped. The ventral surface is flattened down to a certain extent. The front end is slightly narrowed and truncated ; the hinder end is usually broad and rounded, but may be finished in a point. The principal characteristic of the genus is the large and peculiar development of the peristome field. This is triangular in shape, with the base of the triangle directed forwards ; the rather narrower gullet-like hinder portion turns towards the left and leads towards the mouth opening. A very narrow canal lies along the right side of the peristome field and nearly the whole way runs to the mouth. The left side of the peristome field is fringed with an adoral band composed of a number of flattened and membranous cilia. This band is not continued off the frontal border. The peristome field, except for this, is unciliated and is not provided with an undulating membrane. The body striation is weak and spiral. The anus is probably at the posterior extremity. The contractile vacuoles are usually entirely passed over; they have been observed by Clapareds, Lachmann and Bütschli to be scattered over the whole body. The macronucleus is long and band-shaped and accompanied by numerous micronuclei. The motion is somewhat quick and rotatory. The length may be as much as 1·5 millimetres. The body is colourless or brownish.

The species occurs mostly in fresh water, but has been found in the sea. It is synonymous with *Leucophrys patula* of Cienkowsky.

Family Spirostomidae. — "Animalcules free-swimming, usually more or less flattened, rarely cylindrical, often attenuate; peristome field excavate, extending along the left side of the ventral surface, from the anterior extremity towards the centre of the body; the oral aperture locate in the angle formed by the posterior border of the peristome; larger adoral cilia forming a right winding or dextrotropous spire, continued along the entire outer margin of the peristome field, or confined to the posterior portion only of that area; the inner border of the peristome occasionally bears an undulating membrane."

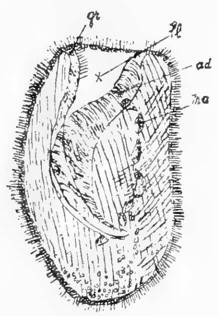


Fig. 28.—*Bursaria truncatella* (× 75).
pe, peristomial groove; *ad*, adoral band of cilia; *gr*, groove leading mouth; *ma*, macronucleus.

Spirostomum amlignum Ehrenberg, is cylindrical in shape, and in most cases has both its ends equally rounded; sometimes, however, the hinder end is truncated, or very much narrowed and forming a kind of tail. The length is about sixteen times the breadth. The animal is of large size, being often as much as 3 millimetres long, and is thus quite visible with the naked eye; by reflected light it looks like a small piece of silver thread. The body substance is in itself colourless, but it may be coloured green through the presence of zoochlorellen, which starts at the anterior end, and is continued often a good way past the middle. Its breadth depends on the state of contraction of the animal. From its posterior end starts a short oesophagus. The adoral cilia run along the left side of the peristome, and end in a spiral coil in the oesophagus. There is no undulating membrane. There is one very large contractile vacuole at the posterior end, with which is connected a collecting canal running nearly the whole way down the back; the anus is at the hinder end. The anus is oval in shape and more or less central in position; many micronuclei are present. The body surface is marked with very distinct spiral striations. The animal lives in fresh water, and moves by the action of its cilia, or by a worm-like twisting and turning. It encysts itself in a lens-shaped cyst formed of concentric layers.

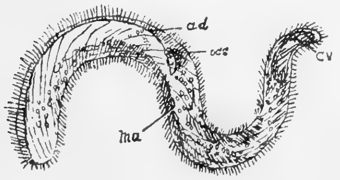


Fig. 29.—*Spirostomum amlignum* (× 100).
ma, macronucleus; *ad*, adoral band of cilia; *oes*, oesophagus; *cv*, contractile vacuole.

Family Stentoridae.—"Animalcules free-swimming, or temporarily adherent, highly elastic and contractile, more or less elongate and cylindrical; often inhabiting, either singly or socially, a mucilaginous or indurated sheath or lorica; the entire frontal border embraced by the peristome; the peristome field circular, or produced into a single central spiral or two lappet-like lateral prolongations; oral aperture perforating the margin or deeper confines of the peristome field; larger adoral cilia or cirri describing a complete dextrotropous or right winding spire; anal aperture situated anteriorly immediately beneath the peristome."

Stentor niger Ehrenberg, when fully expanded, is trumpet shaped; the anterior end is broad and truncate, the posterior end tapers off to a narrow rounded extremity; when contracted it is bag shaped, or pear shaped. It is sometimes free-swimming, sometimes sedentary. In the latter case it attaches itself by its narrow hinder end. The peristome runs almost completely round the anterior border, its left end is folded in a spiral fashion, and leads to the oral aperture; the right limb is free and raised considerably above the

Fig. 30.—*Stentor niger* (× 300).
l, left limb of peristome; *r*, right ditto; *mth*, mouth; *cv*, contractile vacuole; *ac*, anterior collecting canal of contractile vacuole; *pc*, posterior ditto; *ma*, macronucleus.

left. The peristomial band of cilia is large and strong. The cilia of the general body surface are very fine and short, and arranged in longitudinal rows. An oval macronucleus and many micronuclei are present. The main contractile vacuole is situated near the anterior end, and into it run two collecting canals; of these one lies round the front border under the peristome, the other is carried directly backwards towards the posterior end. The anus is situated immediately in front of the contractile vacuole. The whole body is beset with numerous blackish pigment granules. The animal when extended is about 300 microns in length.

This species lives in bog water, and encysts in a thick pear-shaped cyst.

(*To be continued.*)

CHAPTERS FOR YOUNG NATURALISTS.

(*Continued from page* 13.)

THE INFINITELY LITTLE.

By J. O. Symes, M.D.

THE rush and hurry of modern everyday life, the exacting demands of social duties and athletic pursuits, leave to most of us but little time for the study of nature, unless, indeed, it be human nature. The habits and instincts of wild animals are to most men a sealed book, and their knowledge of the life-history and development of the smaller insects is such as has been gleaned from the pages of a popular magazine. Such, then, being the case, it is not wonderful that with regard to still more minute forms of life the most profound ignorance is almost universal. I refer more particularly to those microscopic organisms classified under such terms as microbes, bacilli, bacteria, etc. It was not until the introduction of the microscope that the existence of such creatures was even suspected. The discoverer of that instrument soon observed and described some of those lower forms of life which we now call germs, the first specimens to be distinguished being obtained from scrapings of his teeth. It was not, however, until the early part of the nineteenth century that the microscope became fully developed, and to what a pitch of excellence it has reached we may judge from the fact that lenses are now made capable of magnifying the size of an object 3,000 to 5,000 times. If it were possible to view a man under such a power he would appear about the height of Mount Everest, and a child would cap the highest Alpine peak.

The modern microscope has opened up a new world to us, and made plain phenomena which to our fathers were matters for the wildest conjecture or the most insoluble mystery. As further progress is made with the mechanical and optical details of the instrument it is possible, and indeed probable, that still more minute forms of life, in comparison with which diatoms will be as mountains and germs as elephants, will come to our knowledge, and will necessitate the revision of all our present ideas.

For a long period it was thought that germs and ferments, which are the terms generally applied to these minute organisms, arose spontaneously; that they were the creation of dirt or of dead matter of any kind. In proof of this assertion it was pointed out that materials which had been boiled for a time, and in which all organisms were presumably dead, would, even if kept in sealed vessels, undergo eventually putrefaction or fermentation, and that they then could be shown to be crowded with germs, which could only have arisen from the materials themselves. It is as if we were to expect seeds to be manufactured from garden mould, or eggs from the gravel of the hen-house. It took years to dissipate this belief; but eventually the work of Tyndall, of Huxley and of Pasteur established the fact that there is no such thing as spontaneous generation. Each germ is and must be the offspring of a pre-existing germ, inheriting from it its physical peculiarities, its habits and its tastes. These workers showed that if a flask containing, say, a solution of sugar, were boiled for a short period for a *succession* of days, so as to destroy not only any germs that might be present, but also their spores or eggs, then, if properly corked with cotton wool so as to prevent the entry of any but filtered air, the contents would keep indefinitely. Directly, however, such contents were exposed to germ-laden air, then and then only would fermentation begin. Microbes are not, then, manufactured from lifeless material; they do not arise spontaneously, but are the products of pre-existing organisms.

It is not, however, remarkable that the theory of spontaneous generation should have been so strongly supported, for germs are practically ubiquitous. "We breathe bacteria, drink bacteria, eat bacteria, and our bodies are the happy hunting-grounds of countless myriads of them." Earth, air and water swarm with them, and they are even to be found in the frozen hail and falling snow. Dust is the great carrier of microbes—the two are inseparable. The number found in any given sample of air will thus vary according to the place from which such a sample be drawn. For instance, a cubic yard of air taken from a mountain peak will contain an average of about one germ; an equal quantity of air from mid-Atlantic will contain six; from a city park, 450; from a city street, 4,000; from an inhabited room, 10,000: the dustiest spots showing the highest averages. At a a moderate computation a man in the course of his three-score years and ten will *inspire* twenty-five millions bacteria, which is about the number he would obtain from half a pint of fresh milk. Just as no atmosphere is free from dust (1) so no atmosphere is free from germs; so that the long-cherished belief that they could spring from nothing and come from nowhere is not as absurd as might at first sight appear.

We will now consider the structure, mode of growth and development of these creatures. Each microbe is a distinct individual, a tiny cell, averaging perhaps $\frac{1}{12000}$ of an inch in length, and $\frac{1}{25000}$ inch in breadth, or, to put it more graphically, of such a size that 400,000,000 of them could find standing room on a postage-stamp. The smallest known bacillus is that of influenza, but recent researches in connection with foot and mouth disease point to the existence of germs so small as not to be revealed by the modern microscope. Yet even in these infinitesimal bodies a distinct plan and structure is detectable. There is a soft central portion covered by a thick outer layer or skin. The outer covering may be transparent or pigmented, or may be pitted or furnished with long waving processes like those of an octopus.

There is an infinite variety in the world of germs, no two species being exactly alike as regards shape, size, or methods of movement and multiplication. In shape they may be rounded spheres, like billiard balls, short straight rods like pencils, or curved, corkscrew, or comma-shaped bodies. Forms resembling clubs or dumbells are not uncommon. If when swimming freely these are observed under the microscope some species will be seen to be stationary, others to spin round like a top, to gently oscillate, to slowly travel in a tortuous serpentine manner, or to dash across the field like an express train. As far as is at present known they have neither legs, wings, nor fins, so that the mechanism of their movement is a complete mystery. Some observers have thought that the long waving cilia, or fringe-like processes, were the means employed, but these are not present in many moving forms. Some of my readers may know that the same mystery surrounds the movement of some of the higher forms of life, such as the diatoms.

If a germ be watched under favourable circumstances, it may be seen to elongate into twice its original length, break suddenly in the middle and become two distinct individuals. Others may be seen throwing out buds, which soon become detached from the parent cells and swim off to lead an independent existence; or, again, an apparently quiescent organism will be seen to split into halves or quarters, and these again to further subdivide. So rapid is their increase that a single microbe may become 16,000,000 in twenty-four hours, the method of procedure being as follows: a germ, we will say, can produce two of its kind in an hour. During the second hour there are consequently four; during the third, eight, and so on, until at the end of three days the original microbe has, it is calculated, become 4,772 billions, weighing some 8,000 tons. Fortunately for ourselves these micro-organisms are tender plants, and unless put under the most favourable conditions cannot increase at anything like the rate referred to. To obtain its maximum growth, each species requires a peculiar temperature, a certain degree of moisture and a particular food. Thus many die by the way—victims to cold, starvation and exposure. Direct sunlight and a constant current of fresh air prohibit the growth of many kinds of bacteria. This is especially true of disease germs, and affords an explanation of the fact that darkness, dirt and a foul atmosphere are the invariable characteristics of an unhealthy house or locality. There are still other dangers that the germ has to grapple with. Like animals of larger size they prey upon one another, and in a limited space crowded with several species the weakest soon go to the wall. Certain species too are guilty of a form of suicide, the chemical products that they manufacture finally killing them; or, if we like to look at it in another way, their life-work completed they choose to depart. For instance, the yeast-germ that converts malt and sugar into alcohol is killed when the alcohol reaches a certain strength. These are, therefore, the first victims to drink! Many microscopic forms of animal life, with which our rivers, soil and air abound, live upon bacteria, and, speaking generally, there are a thousand and one agencies at work keeping their numbers within reasonable limits.

In order to prevent their absolute extinction certain means of protection have been provided by nature. This protective measure is known as "sporing." The oppressed and hunted bacillus can, as a last resort, alter its original shape, become spherical, and throw out around itself a horny covering. Within this it can defy for considerable periods of time the extremes of heat or cold—boiling and freezing. Damp or drought, starvation or plenty, now make no difference. The organism for a time has ceased to be a bacillus and becomes a "spore," a condition

(1) "Dust," by J. O. Symes, M.D. SCIENCE-GOSSIP, N.S. vol. iv. p. 100.

combining the advantages of the hibernating dormouse and the rolled-up hedge-hog. Spores may remain unaltered for years and then come to life again. Thus, as they have a high resistance to heat, cold and chemical substances, they play a great part in the history of the life-struggle of each particular species.

It would be too long a task to attempt to describe the various methods employed in studying bacteria, and I shall consequently not do more than indicate just the outlines of these procedures. The first step is to discover upon what substance the germ will best flourish—no easy task, for their appetites are as variable and fastidious as those of chronic dyspeptics. Some grow best on milk, others on broth or beef tea, on clotted blood, or on jelly made from nutrient gelatine or sea-weed. Slices of potato, bread, white of egg, and other luxuries too numerous to mention, are all utilized. Whatever is used is carefully boiled first to destroy any other micro-organisms that may chance to be present, and every instrument and piece of apparatus is similarly treated, this process being called "sterilization." Whatever be the medium chosen, the germ or substance to be examined is now mixed with it in a test tube, which is promptly sealed to exclude all air-borne species. The particular temperature at which each germ will grow best has to be found by many tedious trials. Most grow well at the temperature of the blood, 98° Fahr., and consequently inoculated tubes are generally put into ovens or incubators kept at that temperature. In these incubators the tubes are kept until there is some evidence of growth, which growth closely resembles that of mould on any damp surface. A portion of the growth is then picked off with a needle, mounted on a glass slide and examined under the microscope. To obtain further information, the specimen is usually stained with one of the aniline dyes, in order to bring into greater prominence minute variations of structure.

In a world so thickly populated as the World of Germs, we should, I think, expect to find good and evil pretty generally mixed. So indeed it is, there being no more reason for saying that all germs are evil than there would be for making the same remark about mankind. Classifying according to their works, we may speak of microbes as those forming *Pigment*, those exciting *Putrefaction* and *Fermentation*, and those *Causing Diseases* in men, animals or plants. There is this advantage in the world of germs, each individual sticks to his own business. One never finds a microbe of putrefaction trying to cause sickness, or a germ of fermentation attempting to manufacture pigment. Each is content to do its best in its own sphere, and possibly Nature intends us to read a lesson from these facts.

The remarkable power of manufacturing colours from colourless materials possessed by our first series of germs has attracted much attention. As a rule the organisms themselves are colourless, but digesting the medium in which they lie they alter entirely its chemical constitution, and new coloured bodies arise—reds, blues and greens being common, also various shades of yellow or orange. One pigment-forming bacillus grows almost exclusively in bread, with the formation of a brilliant scarlet colour. Every now and then this bacillus invades a country, and the householder finds his daily loaf mottled with blood-red spots. Its last recorded appearance was in Germany five or six years ago. During the middle ages, when superstition was rife, the occurrence of "bloody-bread," as it was called, was, especially if the sacramental bread was affected, regarded as an omen of the very worst kind, and gave rise to the wildest excitement. More than once it was thought that the bread had been tampered with by religious opponents, and bitter persecutions at once arose. Another air-borne microbe has the power of giving a black colour to rain, the water collected, in spite of precautions taken for the cleanliness of vessels or roofs, being as black as ink. The consternation and fright of the people in a country-side so invaded may be more easily imagined than described. A case of this kind was recorded in SCIENCE-GOSSIP (N.S. vol. ii. p. 294) by Mr. W. F. de V. Kane, in Ireland. Milk is often coloured by the action of bacteria. Yellow, buff, red, or blue milk is not uncommon, apart altogether from the manipulation it sometimes receives at the hands of some not too honest retailers. Not infrequently the discharges from wounds receive a yellow, green, or blue coloration from the presence of bacteria. Coloured snow is from time to time recorded. Such, then, are a few of the phenomena connected with colour-producing bacilli. With a wider knowledge of bacterial methods of growth these powers will, I have no doubt, be utilized for commercial purposes, such as calico-printing, dyeing, etc.; providing the fugitive tendency of some of these colours can be arrested.

(*To be continued.*)

THE new observatory at Heidelberg was opened on June 20th. Professor Valentine will have charge of the astrometric department, and also attend to the determination of time and its communication to railways, etc. There is a 6-inch Repsold meridian circle. The astro-physical department is in charge of Professor Max Wolf, who has been so successful in celestial photography. The equatoreal is mounted in a dome eighteen feet in diameter, which can be rotated completely in eight seconds. Another dome, twenty feet in diameter, is for the astro-photographic instrument being constructed by Brashear, and provided by the liberality of Miss Catherine Bruce.

BOTANY OF SOUTH-WEST LANCASHIRE.

By J. A. Wheldon.

As many visitors are now drawn to this part of England by the attractions of New Brighton, Southport and Blackpool, the following account of the plants seen on a July day's ramble in South-west Lancashire (*vice* county 59) may be of interest to some of the readers of Science-Gossip. The route taken was arranged to cover varieties of situation, from a botanical point of view.

Starting from Walton, near Liverpool, the first five miles lies through country lanes, over a broad tract of cultivated fields, where the only plants met with are ordinary agrestal weeds. In the hedgerows we noticed a few Rubi, the most abundant being *Rubus corylifolius* var. *sublustris*, **R. gratus* Focke, *R. lindleianus* Lees, *R. leucostachys* and, in one place only, *R. sprengelii*. The station for **R. mercicus* var. *bracteatus* has been destroyed by town "improvements." The hedgerows here are kept closely trimmed and carefully weeded, but a few bushes of *Rosa urbica* and *R. dumalis* are displaying their blooms and occasionally the great bindweed (*Convolvulus sepium*) succeeds in throwing up its gay festoons. By the canal across which we go occurs *Chenopodium rubrum*, and at the bottom of walls *Sagina apetala* is frequent.

On approaching Ince Blundell the scenery becomes more sylvestral in character. Before the road enters the wood, there is a wayside ditch choked with the dropwort (*Oenanthe crocata*). In the wood itself we find an entirely new florula. We now observe for the first time on the journey **Rubus pulcherrimus* Neum and *R. rosaceus* var. **sylvestris* Murr. The giant bellflower (*Campanula latifolia*) is not yet in bloom, but the foxglove (*Digitalis purpurea*) is splendidly decked with its purple bells, and *Carex remota* abounds. The mosses here are not noteworthy. None of the corticolous species are found, but the ground is carpeted with *Mnium hornum* and *Plagiothecium denticulatum*, and in one corner only there is a little *Eurhynchium piliferum*. These woods abound in deep still ponds, their waters dyed of a stygian hue by the decay of generations of rotting vegetable matter. The plants of all these ponds are embraced in the following description of one of them. In the deep water of the centre floats *Potamogeton natans*, around which is a zone of *Alisma plantago* with *Iris pseudacorus*. The margins are thickly fringed by dense patches of *Sium angustifolium*, *Ranunculus sceleratus*, *Rumex conglomeratus*, *Carex pseudo-cyperus* and *Phalaris arundinacea*. Here and there may be seen an occasional floating patch of *Lemna trisulca*. Resuming our walk on the high road through the wood, the tall stems of *Urtica dioica* var. **angustifolia* Blytt are conspicuous, but always just within the shade of the trees. In the open, the plant assumes its ordinary aspect, and many intermediate forms occur between.

Leaving the grateful umbrage of the wood, we emerge into a broad expanse of flat country, drained by the river Alt, a sluggish, ditch-like stream. There are no hedges, the fields being separated by deep dykes, such as are known as "stells" in North Yorkshire. The florula of these drains differs widely from that of the pools and ditches in the wooded region we have just left behind. *Hippuris* and *Hottonia* now appear in profusion; *Alisma ranunculoides* replaces *A. plantago*, and *Carex echinatus* and *C. vulpina* replace *C. pseudocyperus* and *C. remota*. Other interesting plants are *Oenanthe fistulosa*, *Sparganium ramosum*, *Equisetum palustre* and *E. limosum*. As we approach the coast, *Scirpus maritimus*, *Ranunculus bandotii* and *Oenanthe lachenalii* are added to our list. Mosses are few and difficult to find in the dense herbage, but we note *Hypnum aduncum*, *Amblystegium riparium* and its var. **longifolium*, also *Brachythecium rutabulum* var. **longisetum*, the latter hardly recognizable at this season. Crossing some fields, where grows a patch of the now rare and decreasing *Bartsia viscosa*, we are reminded of the close proximity of the sand-hill tract by the fluttering past of a grayling butterfly (*Satyrus semele*).

The railway must now be crossed, and thinly scattered for miles along its banks are *Sisymbrium pannonicum* and *Sinapis muralis* var. *babingtonii*. The weedy ground in proximity to the "iron road" also yields, amongst other things, *Pastinaca sativa*, *Oenothera biennis*, *Reseda lutea* and *Saponaria officinalis*, with its var. *puberula*. A wealth of colour is lent by the glorious blue of *Echium vulgare* and *Lycopsis arvensis*, and the grassy hollows are spangled with the stars of *Erythraea littoralis* and *E. centaurium*, *Chlora perfoliata*, *Parnassia palustris*, *Rubus coesius* var. *aquaticus*, and everywhere *Carex arenaria* and *Equisetum variegatum*. *Erythraea latifolia* Sm., formerly abundant here, is now lost.

The mosses here are somewhat less interesting than they are further north towards Southport, owing to lack of moisture, and we also miss *Pyrola rotundifolia* var. *maritima* and **Viola curtisii*, which occur there. Still, we cannot fail to observe *Brachythecium albicans*, *Hypnum rutabulum* var. **plumulosum*, *Bryum pendulum*, *B. lacustre*, *B. pallens*, *B. uliginosum* and *Amblyodon dealbatus*, the

* Plants thus marked are not noticed in the district floras, and some of them now first recorded for the vice county.

last five in fruit. *Hypnum elodes* grows sparingly by the Alt, and with it *Hypnum filicinum*, *H. aduncum* forma **fulcatum* Renauld, and *H. polygamum*, in fruit. In damp places *Orchis incarnata* and *Epipactis palustris* abound, with occasionally *Samolus valerandi*, and, in drier spots, *Polygala oxyptera* and *Cerastium tetrandrum*, the latter now seeding.

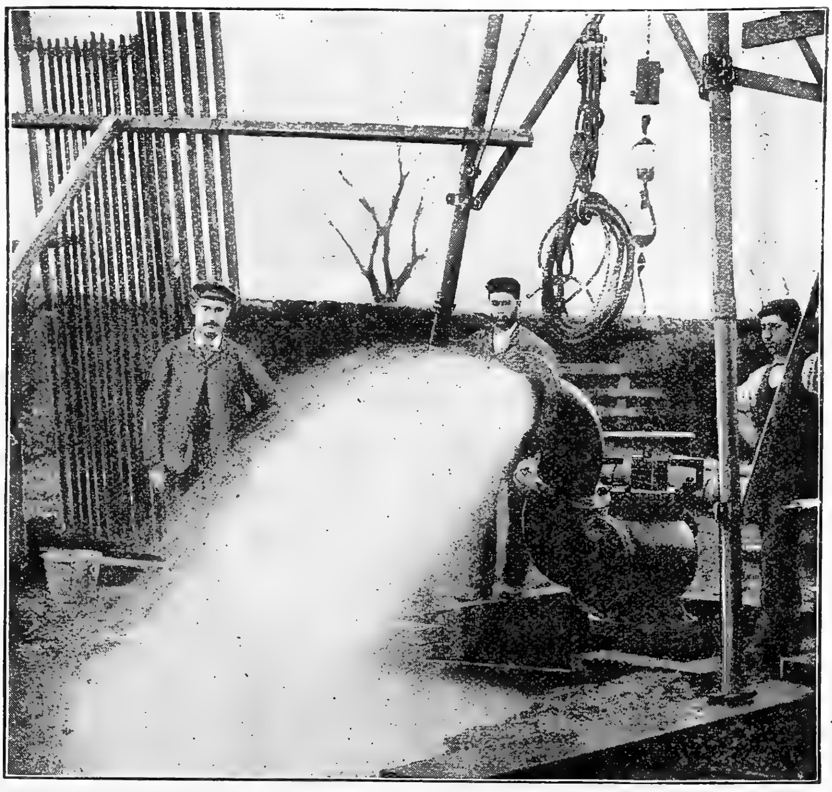
Crossing the sand dunes towards the beach, we see **Tortula arenicola*, now barely recognizable, the fine yellow stellate cushions of spring having become shrunk, blackened and hoary, and the plant is evidently dormant. Passing through breast-high marram and abundance of *Euphorbia maritima* and *E. portlandica*, we find *Cynoglossum vulgare*, and very rarely its var. **subglabrum*, before we reach the shore-line. Here *Atriplex babingtonii* and *A. prostrata*, *Sueda maritima*, *Cakile maritima*, *Honckenya peploides* and several other strictly maritime plants can only be glanced at, as unfortunately time and trains wait for nobody.

The majority of the objects mentioned are abundant, and such as obtrude themselves on the botanist's attention; they may all be found with but little search in such a ramble as I have described, in this part of South-west Lancashire.

H. M. Prison, Liverpool; July 11th, 1898.

ARTESIAN WELL AT BOURN.

WE illustrate below the mouth of a remarkable artesian well, which was bored by Messrs. C. Isler and Co., of Bear Lane, Southwark, and which overflowed from a depth of 120 feet from the surface at the rate of 2,592,000 gallons, and at 134 feet at the rate of 5,011,200 gallons per diem. The boring ends in oolitic beds, and the water is conveyed to Spalding by gravitation, a distance of ten miles. Chalybeate water was found at 65 feet 10 inches. This was safely excluded by the driving of 13-inch pipes, and the main springs were tapped at 78½ feet, at the commencement of oolitic limestone. The pressure at each depth remained the same, viz., 10 lbs. to the square inch. The following section was passed through: Alluvial and Fen Beds, 9½ feet; Cornbrash, 6½ feet; Great Oolite Series, 60 feet; Lincolnshire Oolite, 58 feet, ending in a very hard oolitic limestone. We are not aware of any well in this country which has yielded a larger supply of water than this one at Bourn, in Lincolnshire, the yield being no less than 3,480 gallons per minute.



ARTESIAN WELL AT BOURN.

E. A. MARTIN.

89, Bensham Manor Road, Thornton Heath.

MALTESE CAVES AND THEIR FAUNA.

By John H. Cooke, F.L.S., F.G.S., Etc.

(*Concluded from page 107.*)

THE details contained in the two sections of this article that have already appeared briefly summarize the results that have been obtained from half-a-century's research in the caverns of the Maltese Islands. These results suggested that further evidences bearing on the quarternary history of the Central Mediterranean might be obtained from the island's superficial deposits; and between the years 1891 and 1894 a careful survey was therefore undertaken. A series of extensive beds were found clothing the sides of the gorges and valleys, the coastlines and fault-terraces, and filling up the caves and rock-fissures of the islands. They have accordingly been grouped into three classes (1): (1) The valley loams and breccias; (2) the agglomerates of the coastlines and fault-terraces; (3) the ossiferous deposits of the caves and fissures. All of these have been found to contain fossils.

In the valley beds of later Pleistocene age there occurs an abundance of fragments of the limb-bones of ruminants, and the horn-cores of a species of Cervus, together with great numbers of land-shells in a sub-fossil condition, *e.g.*, *Helix aspersa*, *H. melitensis*, *H. vermicularis*, *Clausilia bidens*, *Rumina decollata*, *Cyclostoma melitensis* and *Clausilia sulcatum*. The shoreline and fault-terrace agglomerates are still more prolific, and, though much older, the remains are as a rule in a better state of preservation. Landshells are abundant, as well as the teeth and limb-bones of the pigmy elephant, *Elephas falconeri*, *E. mnaidra*, *Hippopotamus pentlandi*, and the horn cores and bones of *Cervus* (sp. ?). A very characteristic series of these beds are to be seen in the neighbourhood of Emtahlep and of Fom-ir-Rieh, two of the most charming and picturesque localities in Malta.

The hillsides of the Binjemmas are there pleasantly varied with groves of trees, in which the fruit and foliage of the medlar, the quince, the lemon, the orange, the pomegranate and the carouba (locust tree) contrast prettily with one another and with the enormous rock masses that lie around garbed in their motley suits of verdant moss and grey lichen patches. Apart from its geological interest the boldness and ruggedness of the scenery of this district well repays a visit at any season of the year.

The plateau region of Malta terminates in precipitous declivities which have for their cappings lines of tall beetling crags of the Upper Coralline Limestone, the summits of which tower over the waters of the bay to a height of from 600 to 700 feet. The whole neighbourhood is full of geological interest, charming scenery and picturesque effect.

The rugged faces of the limestone bluffs that encircle the summits of the plateaux and cap the hills around the bay are perforated and seared with caverns and fissures, many of which serve as the outlets for the perennial springs that have their origin in the highlands around. In the summer time these springs meander unobserved through the gullies and among the foliage that flank the ravines; but in the rainy season they assume larger proportions and leap from terrace to terrace in sparkling seething masses in their downward rush to the sea.

The wild scenery which characterizes the extremity of the Great Fault near Ras el Raheb is, in the winter time, greatly enhanced by one of these miniature cataracts. From the mouth of a cavern fissure which has been channelled out of the Lower Coralline Limestone cliffs a small torrent bursts forth, and, as if impatient for the daylight of which it had been so long deprived, it takes a flying leap of 300 feet over the sea-wall, and breaks up in its headlong descent into a silvery sheet of impalpable spray upon which the glowing sunlight forms halos and coronas of the most exquisite colours: "A cloud of mist, that, smitten by the sun, Varies its rainbow hues." These brilliantly-coloured airy nothings suspended in mid-air and coquetting with every zephyr that sweeps along the cliffs impart a great charm, and invest the locality with more than a passing interest.

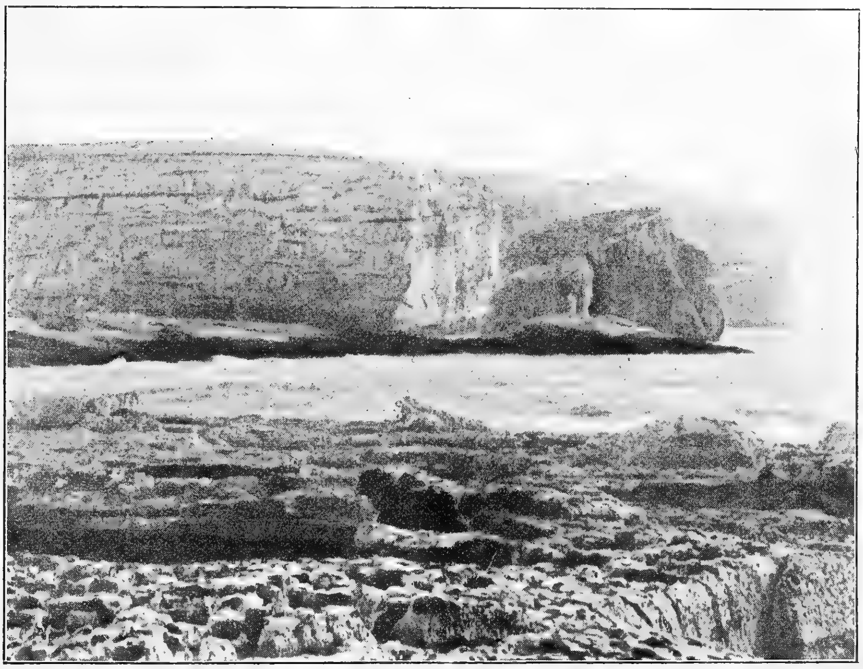
For the geologist Fom-ir-Rieh is specially inviting. The geology of Malta and Gozo is here epitomized, and every phase of the eventful history through which the islands have passed, from the time when their foundations were laid down in the depths of an Oligocene ocean to that when the rock masses were elevated to their present position may be seen written in unmistakable characters in the cliffs and scaurs, and in the heterogeneous assemblage of remains which lie entombed in them. (2) The chocolate-coloured nodule seams which traverse the faces of the limestone cliffs abound in relics of the

(1) For further details see the following papers by J. H. Cooke on the "Pleistocene Beds of the Maltese Islands." (1) Geol. Mag. vol. viii. No. 326, p. 348; (2) Quart. Journ. Geol. Soc. vol. 51, 1895; (3) Geol. Mag. vol. iii. No. 383, p. 201.

(2) Cooke, J. H.: "The Globigerina Limestones of the Maltese Islands," Quart. Journ. Geog. Soc., Vol. 51, 1896.

midgets and leviathans that once swarmed in the waters of primeval Malta. Teeth and vertebrae of sharks, whales, dolphins and seals lie side by side with the tests and spines of sea-eggs and the shells of the progenitors of the more familiar cockle and whelk. Sea butterflies (Hylae) have left their remains in such abundance as, in places, to constitute a considerable portion of the rock-mass, and ofttimes lie curiously intermingled with sea-dates, crabs, and a very mixed assortment of protozoons and foramens. In most of these seams dark-coloured nodules of phosphate of lime form the predominating element (³). The majority of these phosphatic nodules are rough and scoriaceous; but many of them are smooth, and have a polish equal to that of a highly finished piece of jet. On breaking them, one or more organisms will be found embedded in their centres. Sometimes it is a shell, a tooth, or a fish-scale, and sometimes an aggregation of the shells of *Globigerina*. It is in these bands of phosphate rock that the explanation of the wonderful fertility of the Maltese soil must be sought for. The plateaux district of the islands has yielded very few of the remains of the hippopotami and elephants referred to. The principal bone caves and fissures have been found in the south-eastern half of Malta, that is, those parts of the island that have undergone the greatest amount of denudation. In this district the ravines and gorges form the main lines of drainage, and the storm waters from the surrounding areas often carry into them some relic of Malta's prehistoric denizens. One of the finest molars of the large Maltese elephant, *Elephas mnaidra*, that has yet been found was picked up in the bottom of the picturesque little gorge of Uied el Zurrick by Sir W. Hely Hutchinson, the late Lieut.-Governor of the islands.

At the mouth of this gorge, in the little baylet of Cala el Zurrico, is a cavern containing an interesting stalactitic formation, which in the semi-gloom bears a startling resemblance to a man hanging by the neck. Within a short distance of Zurrico lies the depression known as the Maeluba punch-bowl. It is a cylindrical hollow depression forming the centre of what was once an elevated plain that extended from Casals Safi, Monsciar and Agathe to the sea. This elevated tract of land is now basin-shaped, and culminates in this sudden downthrow. The sides of the hollow are perpendicular and rugged, and they show on their faces distinct scorings of the character of "slickensides." These were probably caused by the friction of the opposing strata in their descent. Covering the bottom is a rich alluvial soil in which a wealth of wild trees and plants, including the convolvulus, orchis, juniper, polyandrium, mathiola, cactus, fig and carouba luxuriate all the year round. According



THE FUNGUS ROCK, DUEIRA, GOZO.

(³) Cooke, J. H.: "The Phosphate Beds of the Maltese Islands," "Mining and Engineering News," May, 1893.

to the tradition of the villagers, the chasm marks the site of a village, which in times past was visited by Divine wrath. It is from this tradition that the place takes its name ([4]). The explanation for the phenomenon given by the geologist is much more simple and convincing. Macluba is one of several fine instances that the islands afford of a collapsed cavern. It several times occurred to me to start excavations in the bottom of this depression, as the caverns in which the late Professor Leith Adams made his discoveries are but a few hundred yards away, but the opportunity never offered itself, so Macluba, with its virgin ground and its possible stores of Malta's extinct mammalia, still remains untouched.

A pleasant walk of about two miles through San Giorgio, Birzebuggia and Marsa Scirocco brings the tower and creek of Benhisa into view. The shores of the little creek are covered with an agglomerate which is still crowded with the remains of extinct dormice, swans, elephants and land-tortoises. The deposits were originally discovered and worked by Leith Adams, but they still contain enough to stock a half-a-dozen museums. The southern coastline of the island is much broken up by ravines and gorges, in the greater number of which the cave-hunter can find plenty to do. Uied el Mistra, one of these, lies between Il Mara and the cavern of Ghar Hasan, and about three-quarters of a mile distant from Benhisa. Unlike most of the gorges that debouch on the southern coastline, it is an arid gully, with scarcely a vestige of plant life. From the roadway which traverses its higher reaches it appears to be one of the last places in the islands that would repay the trouble of exploring. On its northern side there is, however, an interesting funnel-shaped cavity which opens out from beneath a broad shelf of rock. Its mouth is circular in shape, and it maintains an uniform height of about six feet throughout its length. Unlike most of the caves of this class it does not contract towards its distal extremity, but it breaks off abruptly and presents a broad, smooth, semicircular wall, the face of which is covered with a layer of stalagmite upwards of six inches in thickness. The floor deposits consist of grey plastic clay, in which were embedded bones of birds, fragments of shells, pieces of a rude coarse kind of pottery; and at a depth of two feet from the surface were the remains of a fire. The cave has evidently been used by the islands' early inhabitants, but how long ago it is not possible to say. The deposits serve only as a rough index, and do little more than demonstrate that the interval of time that has elapsed since the first occupation is one of considerable length.

A mile away to the north-east is situated the cavern known as Ghar Hasan. It consists of a funnel-shaped dilatation with several fissures and smaller tunnels branching off from its extremities and sides. Three of these branches are of a size sufficient to allow of a person traversing them comfortably, but progress through the others is impracticable on account of their narrow dimensions. The larger embranchments ramify in various directions, and in several cases they return upon the main branch, thus forming circular and elliptical courses. The cavern has three entrances, all of which abut on the cliff face. Access to the interior can be made but by one only. The others can be approached only by making a detour of the branch fissures.

The contours of the cave walls and the irregular manner in which the projecting crags and bosses of the cave have been worn, as also the character of the heavy yellow clay which covers the bottom, seem to indicate that the passages owe their origin to the action of running water. Even in the summer time a copious supply of dripping water finds its way into the cave, while in winter a miniature stream occasionally meanders onward and precipitates itself over the cliff into the sea. Most of the water finds its way into the cavern through the numerous swallow-holes with which the roof is perforated, and which are probably in connection with the surface. The cave commands a fine view of the Mediterranean; but considering the difficulty, not to say danger, that is attendant on obtaining access to it, it is questionable whether the pleasure that is to be derived from a visit is commensurate with the trouble and risk that must be incurred. Excavations have from time to time been made within its precincts, but nothing of interest has been forthcoming. Intermixed with the clay that strews the bottom are considerable quantities of bones referable to various species of doves, gulls, bats, and rats, such as at present find a shelter and a home within its recesses. Fragments of pottery, too, are abundantly strewn about; but they are all of an apparently recent type. The remoteness of its situation, and the evidences which it exhibits of having had occupants are considered by the country people to be of sufficient importance to entitle the cave to a prominent position in their legendary lore. In this instance the reference is of an historical rather than of a supernatural character. The cave is said to have once served as a retreat for the notable Saracen sea-pirate, Hasan, who continued to live in Malta some time after his fellow-countrymen had been expelled.

Such, then, are some of the more interesting of the numerous ossiferous beds which the Maltese islands afford. There still remains much to be done; for the district offers unlimited sport to the geologist and cave-hunter alike.

Battenhall Road, Worcester.

([4]) Macluba = overturned.

SCIENCE IN SESSION.

THE BRITISH ASSOCIATION.

THE results of this year's meeting of the British Association must be considered, on the whole, successful. The attendance numbered some 2,500 persons, and the visitors were received by the citizens of Bristol with marked hospitality. The Colston Hall having been destroyed recently by fire, the local committee were forced to find accommodation at the People's Palace. The address of Sir William Crookes, F.R.S., as President, excited a good deal of interest from the unexpected and somewhat surprising character of its subject-matter. To many of those who crossed the immense prairie regions of North America on the occasion of the Association's visit to Canada, the president's statement, that in view of the growing demand for wheat thirty years would be the limit to its natural production, unless assisted by artificial means, must have come rather as a surprise. His guarded references to telepathy could offend no one. A conversazione was held at the Clifton College, where the visitors were entertained by demonstrations of wireless telegraphy and of the spectra of the atmospheric elements. The social interest of the gathering—by no means the least important—was well sustained. An excursion to Bath, made at the invitation of the Mayor of that city, was largely attended; on this occasion the visitors having much to interest them in the way of archæology and the physical and natural sciences.

The sectional presidential addresses were all of average interest. In Section A—Mathematical and Physical Science, Prof. W. E. Ayrton, F.R.S., after referring to the loss sustained by science through the accident to Dr. John Hopkinson, and welcoming the members of the International Magnetic Conference, took for his subject the "Physics of Smell" as a new field of research, and described what he and others had contributed to a knowledge of the subject. Professor F. R. Japp, F.R.S., addressed Section B—Chemistry, on Stereochemistry and Vitalism. In Section C—Geology, Mr. W. H. Hudleston, F.R.S., dealt with the geology of the Bristol area and Severn estuary. Professor W. F. R. Weldon, F.R.S., in Section D—Zoology, discussed the problems arising from variation, inheritance and selective destruction among animals. In Section E—Geography, Colonel G. E. Church took for his subject the geography of the Argentine and the ancient Pampean Sea. In Section F—Economics, and Section G—Mechanical Science, Dr. J. Bonar and Sir John Wolfe Barry respectively presided. In Section H, Anthropology—which later provided the sensation of the Bristol meeting through M. Louis de Rougemont's paper on the natives of unexplored Australia—Mr. E. W. Bradbrook spoke on "The Unity of the Anthropological Sciences"; and in Section K—Professor F. O. Bower, F.R.S., discussed the homology of the members of the vegetable world generally.

INTERNATIONAL CONGRESS OF ZOOLOGISTS.

THE fourth International Congress of Zoologists, under the patronage of the Prince of Wales and presidency of the Right Hon. Sir John Lubbock, Bart., M.P., F.R.S., met at Cambridge in the last week of August. Its meetings are triennial, and this was the first held in Britain, the previous gatherings having been held at Paris, with 60 members; Moscow, 120 members; and Leyden, 200 members. In his address, delivered on August 23rd, Sir John Lubbock took for his subject the importance of international conference in scientific matters, and the value of the study of science for the general well-being of mankind. The president proceeded to show how much was still awaiting investigation, and how many workers were still required. Proceeding with instances of recent discovery, he showed the value of studying common things and incidents close to hand. Among the invitations and entertainment provided by the Committee for foreign and other visitors, in addition to the local attractions offered by the reception committee at Cambridge, were visits to the Zoological Gardens in London, the Natural History Museum, Cromwell Road, the Royal Societies Club, the Museum of the College of Surgeons, the Hon. Walter Rothschild's Museum at Tring, the collection of deer at Woburn Park, and the Marine Biological Laboratories at Plymouth and the Isle of Man.

The meetings of the Congress were sectional, being divided into (*a*) General Zoology, (*b*) Vertebrata, (*c*) Invertebrata, excepting (*d*) Arthropoda. The papers read before these sections were numerous and varied, and by some of the leading zoologists of the world. The question of nomenclature, which it was hoped would receive the attention of the Congress and possibly some approach to settlement, was left untouched. The next or fifth Congress is to be held in Germany in 1901, the town to be selected by the Permanent Committee of the Zoological Congress in Paris. Not the least interesting ceremony was the presentation of nine of the leading foreign visitors to the Vice-Chancellor for honorary degrees. The orations describing the attainments of each were delivered by Dr. Sandys, the Public Orator, who adopted the reformed pronunciation in his Latin addresses.

THE "Journal of Malacology" has returned to its founder, Mr. Walter E. Collinge, who will in future conduct it instead of Mr. Wilfred Mark Webb.

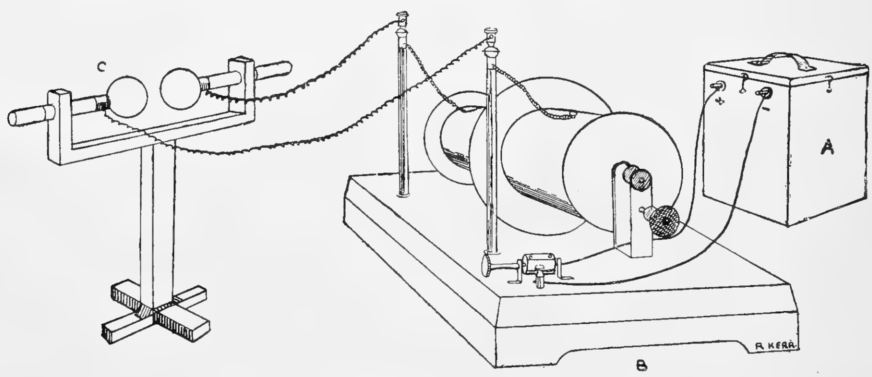
BOOKS TO READ

NOTICES BY JOHN T. CARRINGTON.

NOTE.—*In consequence of the great variety in sizes of books now published, the old descriptions, founded on the folding of the paper on which they are printed, will not in future be followed in these pages. In its stead their size, including binding, will be given in inches, the greater being the length and the lesser the breadth, unless otherwise specified.—Ed.* SCIENCE-GOSSIP.

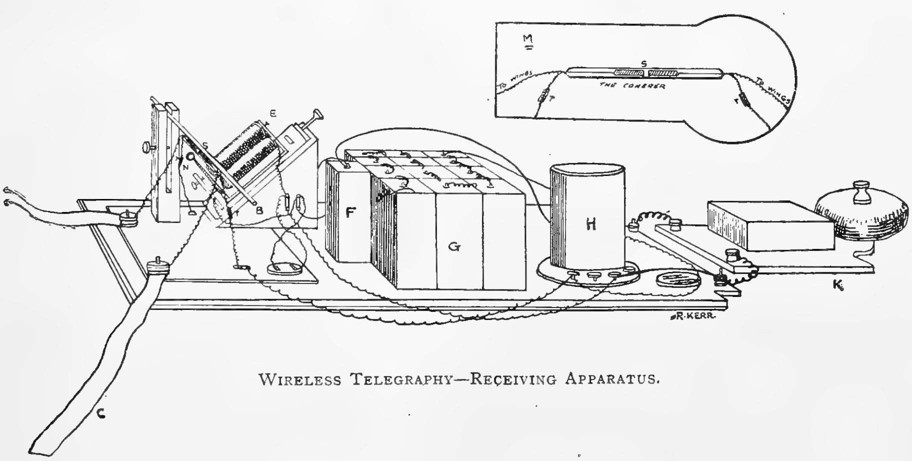
Wireless Telegraphy. By RICHARD KERR, F.G.S. 126 pp. $6\frac{1}{2}$ in. $\times$ $4\frac{1}{4}$ in., with 13 figures and 4 portraits. (London: Seeley and Co., Ltd., 1898.) 1s.

Mr. Richard Kerr has succeeded not only in popularly explaining the somewhat mysterious telegraphing without wires, but also in obtaining a preface for his little work from Mr. W. H. Preece, C.B., F.R.S., the Engineer-in-Chief of the British Post Office, and acknowledged authority on telegraphy. In this preface Mr. Preece states that the author has arranged his subject-matter in readable form, "the illustrations are excellent, and the descriptions of the experiments are accurate." With such an influential introduction we naturally expect much from the hundred and odd pages that follow. Nor are we disappointed, for the lucid style and terse sentences soon give one a good grasp of the whole subject of wireless telegraphy. Mr. Kerr has divided his book into an introduction, eight chapters, and appendix. The titles will give a good idea of the plan and contents of the book, they are (1) "Supposed Oriental Powers of Signalling through Space without Wires"; (2) "Is there Anything Solid?" (3) "Vibrations in Air and in Ether"; (4) "James Bowman Lindsay"; (5) "Induction Experiments by W. H. Preece, C.B., F.R.S."; (6) "Hertzian Waves—Experiments by Signor Marconi"; (7) "Hertzian Waves—Experiments by Dr. Lodge, F.R.S., and others"; and (8) "The Uses of Wireless Telegraphy." The appendix contains detailed descriptions of a technical character of various terms and instruments mentioned in the preceding chapters. Although, as the author points out, it has long been strongly suspected that certain oriental races have some knowledge of transmitting signals by means unknown to Europeans, and without the aid of telegraph wires or other recognized means of communication, it is only recently that the subject of wireless telegraphy has occupied scientific investigators. So long ago as 1853 that remarkable man James Bowman Lindsay, weaver and self-taught electrician, worked upon the idea, which is now being practically carried out. Indeed, he actually showed, in 1859, the possibility of wireless telegraphy to the members of the British Association at Aberdeen. Still, as Mr. Preece says in the preface to this book, the system was not then practical on a large scale, nor novel, as somewhat similar experiments had been carried out by Morse in 1842. There are now several systems which are successful, all more or less on the same basis. Among these the more important are those of Mr. Preece and Signor Marconi. It was not, however, until Mr. Preece seriously took up the subject some few years ago, and completed experiments, which have been reduced to practice and are now in daily use in the Bristol Channel, that any headway was made in wireless telegraphy. The means by which wireless signalling is attained may shortly be stated to be the adaptation of the wavelets of electricity created by sudden agitation, in much the same way as wavelets result when one throws a stone into still water. These spread in all directions, and it is only necessary to arrest them at any point to get an exact record of their formation by the person desiring to communicate with us. These electrical wavelets or ripples move with almost inconceivable speed, passing through anything or everything at a rate equal to one hundred times round the earth in a dozen seconds. To understand this the better we must remember that as water has its ripples, so has air, which convey to us sound. The medium known as ether appears to be that which supports the electric waves used in these experiments. This was first indicated by Clerk Maxwell, and later experimentally detected by that brilliant physicist, Dr. Hertz, who died in 1894, all too soon, at the early age of thirty-seven. Hence it is that these vibrations or wavelets have come to be known as the Hertzian waves. As these vibration ripples go everywhere and may be stopped and studied by anyone, it was necessary to invent an instrument which would maintain the secrets of the Telegraph



WIRELESS TELEGRAPHY—TRANSMITTING APPARATUS.

Department. This has been attained thus: it will have been noticed with regard to the sound-waves in air that two objects may be made sympathetic to a particular note. For instance, if a glass is so sharply struck as to emit a definite sound, one of the strings in a piano yards away will respond and give off the same note. The reverse often happens, when the performer on a piano is annoyed by some object in the room responding when a particular note is struck on the instrument. This fact has been seized upon, and it is found that by "atuning" for ether vibrations the transmitting instrument and the receiver with great exactness, it is possible to maintain the secrecy of wireless telegraphy as perfectly as can be done with a "private wire" at the General Post Office. By permission of Messrs. Seeley and Co., we reproduce drawings from Mr. Kerr's book of a transmitting apparatus and of a receiving apparatus used in wireless telegraphy. With such simple instruments messages have been sent through space scores of miles. Nothing appears to disturb the ether ripples which convey them, neither storm nor obstruction, be it building or mountain. We have already drawn deeply upon the information contained in Mr. Kerr's work under notice, and it would be manifestly unfair to exhaust his theme. We have pleasure in strongly recommending this book to our readers as an excellent account of a little-understood subject. It is written in such careful manner that there is not the slightest difficulty in following the author's points. So simple a story is it, as told by Mr. Kerr, that one becomes fascinated, and finds, indeed, there is something new in the world, and the news is of immense importance to mankind in the future.



WIRELESS TELEGRAPHY—RECEIVING APPARATUS.

A Classification of Vertebrata. By HANS GADOW, M.A., Ph.D., F.R.S. 92 pp. $8\frac{1}{2}$ in. × $5\frac{1}{2}$ in. (London: Adam and Charles Black, 1898.) 3s. 6d.

In his new classification of the vertebrates, Dr. Gadow includes both recent and extinct animals. Perhaps the best way of giving our readers an indication of the author's work is to quote from his preface. He says: "The groups into which we are used to combine the animals of the various classes are not, and cannot be, all equivalent. The least objectionable, or rather the most generally accepted 'orders' are those of the Mammalia, and it is well understood that the ornithologist's 'orders' are of far less morphological value, while the time-honoured 'orders' of Reptilia are of infinitely greater importance. Each class has, so to say, its own standard units, just as one nation reckons in £ s. d., another with dollars and cents, and a third with mark and pfennige, which again are not the same as francs and centimes. However, to mitigate the discrepancies as much as possible, and chiefly owing to the bewildering mass of fossil reptiles which have come to light, I have arranged the reptiles in numerous sub-classes, and these again in orders, while for the host of fishes 'divisions' and 'legions' have been resorted to as intermediate groups between sub-classes and orders. After all, the practical aim of our classifications is sorting and grouping; the ideal aim is that the system should be a condensed expression of the phylogeny of the creatures dealt with. There are many, and there will be more classifications, all artificial and dependent upon the taxonomic value which we happen to attribute to the various organs. There can be only one true or natural system, namely, that which expresses every degree of affinity or descent of every creature which has ever lived or is still living. To that gigantic system, however, no classification will be applicable. Each horizon will require its own classification, with its necessarily arbitrary boundaries." The arrangement is based upon ascending order. With regard to nomenclature, Dr. Gadow says: "Concerning generic names, I have been as conservative as possible, using those which we are familiar with in treatises of general zoology and comparative anatomy." For this we beg to offer the author our grateful thanks. The index is most useful, and to a large extent also acts as a glossary. This work is one that must be studied by every zoologist with the slightest pretence to scientific attainments. The book is beautifully printed on alternate sides of the pages, leaving the others for the student's notes.

A Text-Book of Zoology. By T. JEFFERY PARKER, D.Sc., F.R.S., and WILLIAM A. HASWELL, M.A., D.Sc., F.R.S. 682 pp. $9\frac{1}{4}$ in. × 6 in., in two vols., with 663 illustrations. (London: Macmillan and Co., Ltd. New York: Macmillans. 1897.) 36s.

The authors of this fine work are too well known to require introduction, further than they were the late Professor Jeffery Parker, of the University of

Otago, New Zealand, and Professor Haswell, of the University of Sydney, N.S.W. Although so bulky and learned looking, the two volumes form a really simple and excellent introduction to the study of zoology. The first carries us as far as the end of the invertebrates; the second volume commencing the vertebrate animals. The drawings are well chosen, and some are produced in colours, as are also several of the maps. Although this handsome work will be invaluable alike to students and teachers, it is eminently a book for the public library and for reference. The examples illustrating the different orders and classes are familiar, and therefore more useful. We can recommend the book to our readers.

Practical Organic Chemistry. By Samuel Rideal, D.Sc. Second edition. Pp. x. and 172, 6 in. × 4 in. (London: H. K. Lewis, 1898.) 2s. 6d.

The detection and properties of some of the more important organic compounds is the object of this little work. The author devotes space to nearly a score of these, giving the chemical formula as well as the name, describing the appearance, where and how to be found, and the properties of each, with their near allies or combinations. It is a useful little work for students and for those in practice, and one sure to go to further editions in course of time.

Transactions of Leicester Literary and Philosophical Society. Vol IV. Part 12, April, 1898. pp. 503-550, and 37 of Report, etc., illustrated with 2 plates. 8½ in. × 5¼ in. (Leicester: Geo. Gibbons. 1898.) 6d.

Among the papers read before the Society on natural science subjects is one, illustrated with two plates, on some human remains found in a gravel pit at New Hunstanton, Norfolk, by Mr. W. Trueman Tucker, F.G.S. These bones appear to be coincident with the deposit of the gravel in which they lay. Their condition precludes any theory as to age or race. The bones are now in Dr. Jonathan Hutchinson's museum at Haslemere, Surrey. The "Scientific Aspect of Entomology" is discussed in a paper by Mr. J. W. Tutt, F.E.S. It is a severe criticism, but by no means unjust, and should awaken a better condition of things among those whom it was intended to encourage.

The Botanical Exchange Club's Reports for 1896 *and* 1897. pp. 509 to 579. 8½ in. × 5½ in. (Manchester: Jas. Collins & Co., Ltd. 1898.)

These are in two parts, the report for 1896 having been published on 31st August, 1898, and that for 1897 on 20th September, 1898. In 1896, 2,639 specimens of plants were distributed, and in 1897 the number was 3,666. The notes on plants circulated are of much interest, and if no other result than the receipt of these reports came of membership of the Botanical Exchange Club, it would be worth joining. Difficult questions are submitted to experts, and the result is of highly educational value to the members.

The Doctrine of Energy. By L. L. 118 pp. 7¼ in. × 5 in. (London: Kegan Paul, Trench, Trubner & Co., Ltd., 1898.) 2s. 6d.

We can hardly imagine that "L. L." expects many of his readers to follow him through all his arguments. If so, we fear he has set some of us a somewhat severe task. As far as one can make out, his proposition is that everything in nature is subservient to a supreme will which may, or may not, be more or less capricious. We fear the philosophy of some of us passeth understanding.

SCIENCE ABROAD

CONTRIBUTED BY FLORA WINSTONE.

Canadian Experimental Farms (Reports for 1897: Ottawa, 1898). Dr. William Saunders, LL.D., F.R.S.C., F.L.S., the Director of the Government Experimental Farms of Canada, has issued another of his interesting annual reports, extending to 449 pages. It is illustrated from photographs and drawings made for this report. The practice of agriculture at the central and branch experimental farms of Canada, is highly scientific, and conducted under Professor Saunders' direction with remarkably successful results. An exceedingly noteworthy series of experiments have been conducted with fertilizers to replace the elements of plant food taken from the soil by repeated cropping, as, for instance, with wheat. One of these trials has a most important bearing upon the subject of supplying a store of nitrogen, such as that referred to by Sir William Crookes at the meeting of the British Association. Professor Saunders finds the great value of planting with seed wheat when sowing a liberal amount of clover or other leguminous crop. The object of this is simply for fertilization, and not as a rotation crop as used in England. The Director, in his report, says: "The fact has been demonstrated that such crops can be put with spring-sown grain without reducing the yield of such cereals, and that after the grain has been harvested the clover will grow vigorously during the summer, act as a catch crop all the season by appropriating the elements of fertility which are brought down by the rain, and at the same time gather and lay up in its roots and leaves a large store of nitrogen for the use of subsequent crops." In the late autumn or early spring the stubble and clover are ploughed in together, the result being that for wheat growing, at least, the clover acts as a high fertilizer. Of course those who have studied the action of the nitrogen storing by the roots of leguminous plants will readily see the advantage of this process. The cost of this fertilizer is only that of the clover seeds sown with the wheat. There are also reports by the Horticulturist, Chemist, Entomologist, Botanist, Poultry Manager, Foreman of Forestry, and others. An illustrated paper, which was read before the Botanical Section of the British Association at Toronto in August, 1897, is here printed, upon the results of experiments in crossing certain shrubs and trees, with the object of creating hardy hybrids for the production of edible fruit. It is illustrated by figures. One of the more important reports is that of Mr. James Fletcher, LL.D., F.R.S.C., F.L.S., the entomologist and botanist. It may be remembered that in the early days of agriculture in the more outlying districts of civilization, Canada used to suffer occasionally from the ravages of the Locustidae, and grasshopper plagues formed frequent complaints of the farmers. In this report Mr. Fletcher states that a notable feature of the correspondence of his division during 1897 was the almost total absence of complaints of injury to farm crops by grasshoppers.

MICROSCOPY

CONDUCTED BY J. H. COOKE, F.L.S., F.G.S.

To whom Notes, Articles and material relating to Microscopy, and intended for SCIENCE-GOSSIP, *are, in the first instance, to be sent, addressed "J. H. Cooke, Edlestone, Battenhall Road, Worcester."*

MOUNTING LICHENS.—In the current number of the "Journal of Applied Microscopy," Mr. G. H. French gives the following method for the mounting of lichens. First the lichen is put into ninety-five per cent. alcohol for twenty-four hours, then into thin celloidin for another twenty-four hours. After this the specimens are imbedded in thick celloidin which is hardened in seventy per cent. alcohol for twenty-four hours and then cut. Cryptogam sections should be stained with borax carmine, as it gives better results than any other stain.

IMBEDDING LICHENS.—For many lichens a harder grade of paraffin must be used than for most vegetable structures. A mixture of hard and soft paraffin, which melts at about 60° C., is recommended. Clear the specimens in pure xylol, and to this add small pieces of paraffin, keeping the dish warm at the same time both to increase the solvent power of the xylol and also gradually and finally to evaporate it all. By this means the material is slowly warmed and penetrated with paraffin. After remaining in melted paraffin absolutely free from xylol for three hours the subject may be imbedded. The sections should be very thin, and before cutting the block should be chilled to somewhat below 20° C. The microtome knife must be very hard, sharp and rigid. Stain by any of the usual methods.

PHOTO-MICROGRAPHY OF OPAQUE OBJECTS.—At a recent meeting of the Botanical Society of Edinburgh, Mr. R. A. Robertson, M.A., B.Sc., read a paper on "A New Method for the Photomicrography of Opaque Stem Sections." One difficulty in making photo-micrographs from recent or fossil stem sections is the trouble of getting a sufficiently large section to bring out diagnostic features. Another is, that it is a difficult process to cut and grind and polish large sections of fossils for photography by transmitted light. Neither can one always get permission to make sections of valuable museum specimens of recent and fossil woods. Mr. Robertson has found that by directly photographing the surface by means of a microphotographic apparatus, excellent pictures, giving all necessary histological details of the tissues can readily be obtained. The recent wood surfaces are planed with a steel plane, and if at all rough the surface is wetted. Very careful focussing is necessary, so as to get equal illumination. An opaque focussing plate should be used for rough adjustment, but the final focussing must be done with a clear glass plate. The illumination was by means of a magnesium ribbon fed through a fixed tube and placed at an angle of 45° and a distance of ten or twelve inches from the surface to be photographed. An exposure of about forty seconds with Ilford plates gave the best results.

BACTERIA IN GROUND WATER.—The readiness with which bacteria may be conveyed to wells in sub-surface water has been shown in some experiments made on the Rhine near Strasburg by Prof. E. Pfuhl. Two kinds of bacteria, neither occurring in the Rhine, were placed in a shallow pit nearly full of water and in one hour one species had passed through twenty-four feet of gravel to a second pit, the other species appearing in the second pit within two hours.

QUICK METHOD OF PREPARING SECTIONS.—It is often desirable to prepare sections of soft tissues in a very short time. To those who are familiar with the collodion method the following suggestions by Mr. M. B. Thomas in the "Journal of Applied Microscopy" will be helpful. Place the tissue at night in forty per cent. alcohol in the dehydrating apparatus. Remove it at 7.30 the next morning. Leave until 10 o'clock in two per cent. collodion. Then place in five per cent. collodion until 11.45. Arrange on the cork and place in eighty per cent. alcohol. The material will be ready to section at 1.30. A total of eighteen to nineteen hours covers the whole operation.

NEMATODES FOR MICROTOME SECTIONS.—The following methods of preparing nematodes for sectioning with the microtome has been used by Dr. Kaiser with much success. The main difficulty to be overcome is the curling up while being killed. To prevent this place the worm on a slide with a few drops of water. Over it place another slide and move it slowly to and fro. This movement causes the worm to straighten. As soon as the nematode assumes the desired position the fixing liquid is pipetted between the slides, the motion of the upper slide being continued until the worm is dead. By this method one can obtain a specimen which is perfectly straight and round.

SECTIONING BOLITIC GRAINS.—Lay a glass slip on a metal plate and place it over a spirit lamp. Soften a drop of nearly dried balsam upon it with heat, and lay a small plate of mica on it so that it will become cemented to the glass. Upon the mica surface imbed in balsam and arrange the small objects of which sections are desired. When the balsam is cold and firm the glass is used as a handle by which to hold the objects whilst grinding. A flat surface may be given them as they lie in the balsam, by rubbing with a hone. Heat the glass to release the mica by softening the lower film of balsam, lift the mica with forceps and turn it over on another glass which has been provided with balsam. The ground glass is now downwards, and the other side may be ground as desired.

LONGEVITY OF GERMS. — Some remarkable observations on the longevity of germs in dust have been recorded by Dr. Miquel, a French biologist and microscopist. In 1881 some earth was taken from a depth of ten inches in Montsouris Park, dried for two days at 30° C., and then put away in a dark corner of the laboratory, first being hermetically sealed in tubes. On recently opening the tubes, after sixteen years, it was found that the dust still contained 3,500,000 microbes per gramme, the original number in the soil having been but 6,500,000 per gramme, which the drying reduced to rather less than 4,000,000. From the surviving bacteria the tetanus microbe was isolated, and so wonderful was its vitality that its action was effectual in guinea pigs after an incubation period of two days.

Globigerina Limestones.—The comparative study of recent and fossil deep-sea deposits is one of the most interesting subjects that a microscopist can take up. Of the fossil deposits, the chalk is a familiar example. The less-known limestones of Miocene age, which are found in Italy, Malta and the Vienna Basin are, however, the best for purposes of comparison. The accompanying figures illustrate the composition of some of these old deep-sea beds. Fig. 1 shows the limestone to be made up of the shells of pelagic *Globigerinae* and their broken-down remains. Mixed up with these are a few *Truncatulina*, *Pulvinulina*, and *Rotalia* shells, Ostracode valves, Echinoderm species, and a few Coccoliths, Coccospheres and Rhabdoliths. Very frequently the *Globigerina* shells make up eighty or ninety per cent. of the whole rock, hence the name given to the limestones. Fig. 2 represents a micro-section of the rock that overlies the Globigerina limestones in the Maltese area. It is a typical Greensand, and its constituents indicate a considerable shallowing of the sea

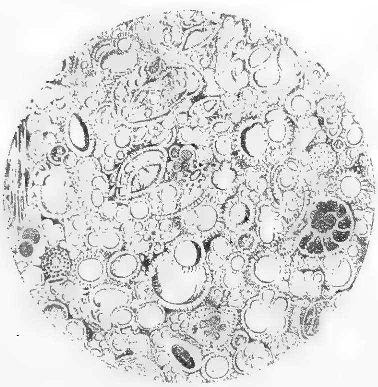


Fig. 1.—Globigerina Limestone.

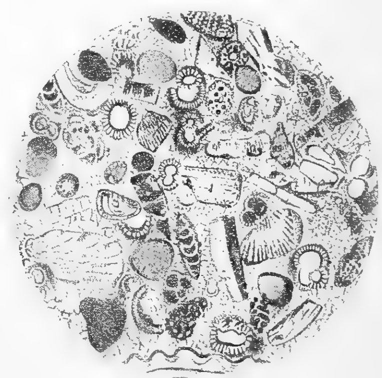


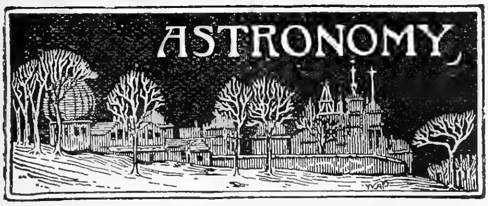
Fig. 2.—Greensand.

bed in the Central Mediterranean. Its foraminiferal contents are as follow: *Globigerina, Orbulina, Rotalia, Pulvinulina, Truncatulina, Textularia, Planorbulina,* calcareous algae, mollusc shells, *Polyzoa, Echini* spines, Ostracode valves and Glauconite. Besides these the Greensands were found to contain the following mineral particles: glauconite, felspars, quartz, augite, hornblende, magnetite, zircon and tourmaline; all of which go to prove the proximity of a shore-line at the time of the deposition of the beds.

Amplifier.—Thirty years ago Dr. Woodward, of the Army Medical Museum, was deeply interested in perfecting the art of photo-microscopy. The device of introducing into the body of the microscope an amplifier was so successfully carried out that he was enabled to obtain a greater and more accurate amplification or magnification of the object with a Wales one-sixth than was possible with the Powell and Leland one-fiftieth. A microphotograph of a frustule of the diatom *Pleurosigma angulatum* had its markings so resolved by the one-sixth plus the amplifier, that they were shown to be hemispherical bosses of silica rather than hexagons, as the one-fiftieth and all other lenses then known made them appear. The result was owing to the superior resolving power of the one-sixth plus the amplifier.

Staining Tubercle Bacillus.—According to Dr. G. Sims Woodhead, the following is one of the best methods of staining the tubercle bacillus. The small, yellow, caseous-looking points from a sputum rich in the bacilli are spread out by pressure between two cover-glasses, so that a fairly thin film remains on each when they are carefully slipped one over the other until they come apart. Thoroughly dry the covers, protecting them from dust, pass rapidly three times through the flame of a spirit lamp, care being taken not to scorch the film, then float film face downwards on the staining solution, which has previously been filtered into a watch-glass. The stain should consist of saturated alcoholic solution of basic fuchsin, one part; absolute alcohol, ten parts; carbolic acid solution (five per cent.), ten parts. Leave the preparations in the watch-glass for twelve to twenty-four hours, unless time is an object. In the latter case heat the fluid gently until vapour is given off, then drop the films on the surface and leave them for from three to five minutes only. Next transfer the covers to an aqueous solution of sulphuric acid (twenty-five per cent.) and when decolourization is complete thoroughly rinse in slightly alkaline water and counter-strain in an aqueous solution of methylene blue. Finally wash in water, carefully dry and mount in Canada-balsam The bacilli should stand out as bright red rods on a blue background of cells.

Paraffin Imbedding Dish.—In the "Journal of Applied Microscopy," Mr. E. Mead Wilcox gives the following simple method of making a paraffin imbedding dish: A Stender dish of the desired diameter, depending on the amount of material to be imbedded, is inverted, and a piece of firm paper is wound lightly about it, so that the edge of the paper projects one centimeter or more above the glass bottom. The free ends of the paper are allowed to overlap and are held together by a piece of gummed paper placed on the outside. The glass bottom of the Stender dish and the paper constitute the imbedding dish. The glass bottom of the dish is coated with glycerine so that the paraffin block can readily be removed. When the paraffin is sufficiently cooled, invert the dish and allow water to run into the Stender dish, thereby cooling quickly the paraffin on the side next the glass. The paper can then be torn away.



CONDUCTED BY FRANK C. DENNETT.

	1898. Oct.	Rises. h.m.	Sets. h.m.	Position at Noon. R.A. h.m.	Dec.
Sun	9	6.17 a.m.	5.19 p.m.	13.0	6° 23′ S.
	19	6.33	4.57	13.37	10° 6′
	29	6.50	4.38	14.15	13° 34′

	Oct.	Rises. h.m.	Souths. h.m.	Sets. h.m.	Age at Noon. d. h. m.
Moon	9	—	7.7 a.m.	2.46 p.m.	23 11 50
	19	11.41 a.m.	3.24 p.m.	7.8	3 23 23
	29	4.8 p.m.	12.1	6.56 a.m.	13 23 23

	Oct.	Souths. h.m.	Semi Diameter.	Position at Noon. R.A. h.m.	Dec.
Mercury	9	11.22 a.m.	2″ 5	12.35	1° 57′ S.
	19	11.46	2″ 4	13.38	9° 11′
	29	0.8 p.m.	2″ 3	14.39	15° 53′
Venus	9	2.40 p.m.	15″ 6	15.53	24° 54′ S.
	19	2.32	18″ 0	16.25	26° 50′
	29	2.18	21″ 1	16.49	27° 50′
Mars	19	5.58 a.m.	4″ 1	7.49	22° 10′ N.
Jupiter	19	11.30 a.m.	14″ 1	13.22	7° 30′ S.
Saturn	19	2.39 p.m.	7″ 2	16.32	20° 24′ S.
Uranus	19	2.4 p.m.	1″ 8	15.58	20° 22′ S.
Neptune	19	3.46 a.m.	1″ 3	5.37	22° 0′ N.

MOON'S PHASES.

		h.m.			h.m.
3rd Qr.	Oct. 7	6.5 p.m.	*New*	Oct. 15	0.37 p.m.
1st Qr.	,, 22	9.9 a.m.	*Full*	,, 29	0.18 p.m.

In apogee October 7th, at 5 p.m., distant 251,200 miles; and in perigee on 20th, at 2 a.m, distant 229,300 miles.

CONJUNCTIONS OF PLANETS WITH THE MOON.

Oct. 8	Mars	5 a.m.	planet	1° 25′ N.
15	Mercury†	0 p.m.	,,	6° 37′ N.
15	Jupiter*	3 p.m.	,,	6° 28′ N.
18	Venus†	7 p.m.	,,	2° 19′ S.
18	Saturn†	10 p.m.	,,	4° 11′ N.

* Daylight. † Below English horizon.

OCCULTATIONS AND NEAR APPROACHES:

Oct.	Star.	Magnitude.	Disappears. h.m.	Angle from Vertex.	Reappears. h.m.	Angle from Vertex.
6	132 Tauri	5·1	4.6 a.m.	90°	5.27 a.m.	276°
8	ζ Cancri	3·0	12.0 p.m.	228°	Near approach.	
22	ρ Capricorni	5·0	5.5 p.m.	28°	5.51 p.m.	303°
24	θ Aquarii	4·3	5.27 p.m.	175°	Near approach.	

THE SUN has large, but not numerous, spots occasionally on his disc.

MERCURY is a morning star at the beginning of the month, rising 1h. 23m. earlier than the sun on the 1st. On the 16th, at 4 p.m., he is in conjunction with, and only 0° 2′ south of, Jupiter, the two planets being little more than 2° north-west of the sun. Mercury is in superior conjunction with the sun at 3 p.m. on the 19th.

VENUS, notwithstanding that she attains her greatest brilliancy at 5 p.m. on the 27th, is very badly placed for observation, owing to her great south declination, and setting about an hour only after the sun.

MARS is increasing in apparent diameter, and rises in the north-east about 10.15 p.m. at the beginning of the month, and before 9.30 at the end of the month. His path takes him from a little north of δ Gemini, 3rd-magnitude, to east of the 5th-magnitude μ^2 Cancri.

JUPITER is too close to the sun for observation, being in conjunction with him at 11 p.m. on the 13th.

SATURN may be looked for as soon as it becomes dark enough. It sets about 2h. 22m. after the sun at the beginning of the month.

URANUS is too near the sun for observation.

NEPTUNE is still about 1° 45′ east of the "crab" nebula in Taurus. The nebula is about a degree and a-half north-west of the 3rd-magnitude ζ Tauri.

METEORS may be looked for on October 13th, 15th, 17th, 18th, 22nd, 24th and 29th.

THE August meteors seem to have been very numerous this year. Mlle. Klumpe, of the Paris Observatory, noted 200 on August 10th, whilst the number *seen* is estimated to reach fully 600.

A BRILLIANT meteor was observed by many on August 11th, at 8.58 p.m., at places so far separated as Somerset, Straits of Dover and Birmingham. The motion was not very swift, and the direction south-western.

BEN NEVIS observatories will be sustained for another year, as mentioned on page 122, through the kindness of Mr. J. Mackay Bernard, of Kippenross, who has promised to give £500 for the purpose.

COMET *b* 1898, Perrine, discovered March 19th, has a period of 322·56 years, according to Herr Berberich and Professor Pokrowskij.

PROFESSOR J. R. EASTMAN has retired from the United States Naval Observatory, after thirty-six years' connection therewith.

A NEW minor planet has been discovered, August 13th, by Herr G. Witt, of the Urania Observatory, Berlin, who discovered Berolina two years since. The new body is remarkable for its rapid motion, which is equal to about 30′, or the diameter of the moon, in right ascension, per diem.

COMET *h* 1898.—In the early morning of September 14th, Herr Pechuele, at Copenhagen, discovered a faint comet in Orion, a little to the north-east of Betelgeux, R.A. 6h. 10m., Dec. N. 8° 56′.

GREAT SUN SPOT GROUP AND AURORA.—A very large spot was observed to have come round the south-eastern limb on the morning of September 3rd. It was alone but for a small spotlet *following* it. On the 6th there were nine tiny spotlets counted, and on the 7th about thirteen. The spotlets afterwards grew and joined, forming two considerable spots following the large one, whilst other spotlets appeared, until the group had a total length of about 130,000 miles and a width of about 40,000 miles. The diameter of the large spot was about 43,300 miles, the umbra itself being about 29,000 miles long. The total area of the group must equal about 5,000,000,000 square miles. On September 9th, from 9 to 9.30 p.m., there was a splendid arch of aurora in the north-north-western heavens, with great rays reaching an altitude of 75° or 80°, and having a motion towards the east. The display was the best seen by the writer for many years.

MAGNETIC STORM.—During the aurora on September 9th, and for some few hours previously, the magnetic records showed considerable disturbance. Telegraphic communication was hindered, and bells rung.

SCIENCE GOSSIP

MESSRS. WELDON AND CO., the well-known natural-history booksellers, are obliged to remove to new premises on the other side of Great Queen Street, London, as the Freemasons require the present shop for addition to their Hall; consequently there are bargains in books to be secured.

SEVERAL daily and weekly newspapers have during the past month made reference to the so-called plague of caterpillars infesting cabbage and cauliflower fields in the South of England. They are, of course, the larvae of *Pieris brassicae*, the common cabbage white butterfly. When stripped of sensational reporting, these accounts record little that is unusual.

IN connection with the caterpillar scare one sees much written by well-intentioned persons whose facts are very much home-made. For instance, one writer attributes the plague to the killing off of "all" our sparrows and swallows. As neither of these birds eat either the larvae or imagines of our cabbage white butterflies, the suggestion is hardly to the point.

THERE seems to be a fatal association of tastes for scientific research and Alpine climbing. The terrible accident which occurred to that distinguished electrician, Dr. John Hopkinson, D.Sc., F.R.S., when he, his son and two daughters were killed, is by no means the only case where a well-known man of high scientific reputation has lost his life through mountain climbing. The list was, unfortunately, already a long one.

A GOOD deal of nonsense has been written during the past month about the danger to sea-side bathers and boatmen from sharks around our western and southern coasts. The subject was started by Mr. F. G. Aflalo in a letter to a daily paper. We should like to know more of these dangerous denizens of the deep to which he refers. We wonder if he identified the species as well as observed the length to within "six inches, either way."

THE trustees of the National Portrait Gallery have done wisely in suspending, in the case of the late Professor Thos. Huxley, the rule of ten years' interval between the death and the exhibiting of a portrait of a celebrity. The picture is a full-sized replica of the portrait painted by the Hon. John Collier in 1883, who has not only specially made the copy for the national collection, but also presented it. Mr. Collier, it will be remembered, married a daughter of Prof. Huxley.

THE death of John Van Voorst, F.L.S., which occurred at his residence in Queen's Road, Clapham Park, on the 24th of July last, removed a connecting link between the science of the collector and that of the investigator. He had passed his ninety-fourth year, and died simply from senility, though maintaining an unclouded intellect to the last. Mr. Van Voorst was unmarried, and with his death his family, of Dutch origin, becomes extinct. He was first engaged in the Longmans publishing house, but in 1833 commenced on his own account as a publisher at 1, Paternoster Row, issuing many excellent books on natural history, by such eminent writers as Yarrell, Edward Forbes, and others. The business was some time ago handed over to Messrs. Gurney and Jackson, who had been in Van Voorst's service from boyhood.

SIR JOHN LUBBOCK was distinctly successful in the pleasant and popular style of his presidential address to the International Congress of Zoologists held last month at Cambridge. Had his remarks been confined to high science only, only a fraction of those who were interested in the daily proceedings which followed would have had their attention drawn to the Congress.

HERR WILCKENS, of Eisenach, is publishing a new work in German, by Dr. R. Tümpel, on the Dragon-flies of Europe. It is beautifully illustrated with many coloured plates, also others of the nymphs, drawn by W. Müller. The work is being issued in two-shilling parts, but it is not to exceed fifteen marks (or shillings) as a whole. Parts 1, 2, and the remainder may be obtained through Janson and Son, 44, Great Russell Street, London.

DR. DANIEL MORRIS, C.M.G., F.L.S., has been transferred from the post of Assistant Director of Kew Gardens, which he has held since 1886, to that of Commissioner of Agriculture for the West Indies. In addition, Dr. Morris will preside over the Botanical Department recently created for the West Indies. His headquarters will at first be in Barbados. There will be ample work to do, for what with agricultural distress, hurricanes and general depression, it is difficult to imagine a worse condition for those unfortunate islands.

DR. MORRIS is by no means new to colonial botanical work. He was Assistant Director of the Ceylon Botanic Gardens in 1877, and made his mark by the investigation of the coffee-leaf disease. In 1879 he was appointed Director of the Jamaica Botanic Department; explored British Honduras in 1882; reported on the botanical and agricultural resources of St. Helena in 1883. In 1890-1891 he officially visited a second time the West Indies, and 1895 saw him officially in the Bahamas.

IN the September number of the "Entomologists' Record" a series of articles on "The Dispersal and Migration of Insects" is commenced by Mr. J. W. Tutt. The articles will consist of "General Considerations affecting Dispersal and Migration," "Migration of Aphides," "Migration of Orthoptera," "Migration of Dragonflies," "Migration of Ants, Bees, Flies, Beetles, etc.," "Migration of Lepidoptera" and "General Conclusions relating to Dispersal and Migration." The material has been collected from every available source.

A GREAT refracting telescope is in course of construction for the Paris Exhibition of 1900. Its aperture is to be 49·2 inches, and its focal length 196 feet 10 inches. The bill is expected to reach 1,400,000 francs. The constructor, M. Gautier, is arranging for the monster to be mounted horizontally, the light entering it being reflected by a plane mirror, having a diameter of two metres and a thickness of thirteen inches. Out of a dozen castings for this mirror, the first was selected as the best. Grinding was commenced on this mirror seven months since, but it is not yet completed. The instrument has two interchangeable objectives, one for visual, the other for photographic observation. It is hoped that under favourable circumstances magnifying powers of from 6,000 to 10,000 diameters will be employed. "La Nature," August 27th, says good progress is being made with the instrument.

BOTANY

Dried Plants Wanted.—May I venture to ask permission to appeal through your columns to amateur botanical collectors to help me to form a herbarium, as complete as possible, for the Free Public Library now in course of erection at Chorley, Lancashire? So lively is my recollection of the difficulties I have had to encounter in deciphering the characteristics of plants, through lack of access to authentic specimens, that I am anxious, if possible, to save others some of that drudgery. I would also show to the casual observer the wealth of beauty that lies about him in the wayside weeds, and perhaps awaken an interest in the beauties and mysteries of nature that cannot help being educational in the highest and widest sense. I would undertake to do the mounting, and append the name of each donor as well as locality to each specimen. If duplicate specimens were sent, the excess could be returned or passed on to the school museums of the town, as might be the wish of the donors. If we get the assistance and donations hoped for, I would suggest the name of the herbarium be "Science-Gossip Collectors' Herbarium."—*F. J. George*, 96, *Park Road, Chorley, Lancashire.*

Plants by the Itchen.—After entering the Winchester Meadows the River Itchen no longer flows in one broad stream, but becomes subdivided into numerous smaller channels. The most important of these streams affords, by the luxuriant vegetation of its banks, a veritable botanist's paradise. Meadow-sweet (*Spiraea ulmaria*) grows in wild profusion all along the banks, and in some favoured spots the large yellow blossoms of the *Mimulus* line the water's edge. The willow-herb (*Epilobium hirsutum*), hemp-agrimony (*Eupatorium cannabinum*) and water-figwort (*Scrophularia aquatica*) here attain great size, the latter frequently reaching a height of over five feet. As we follow the narrow path skirting the stream we notice the bedstraws (*Galium*) covering the grass with a carpet of white and yellow, whilst the trefoils (purple, yellow and white), vervain, enchanter's-nightshade (*Solanum dulcamara*), field-knautia (*Knautia arvensis*), kidney-vetch (*Anthyllis vulneraria*), common flea-bane (*Pulicaria dysenterica*), ragwort, St. John's-wort (*Hypericum perforatum*), woundwort (*Stachys sylvatica*) and horehound (*Ballota nigra*), the latter, always unmistakable from its extremely disagreeable odour, meets the eye on every side. Travellers' joy (*Clematis vitalba*) festoons the bushes, and the white flowers of the great bindweed peep out from among the foliage. The watercress and forget-me-not (*Myosotis palustris*) grow abundantly in the shallow water. No less rich in flowers is the railway embankment which follows the course of the stream for some little distance. A few yards to the left of our path wide-spreading patches of wild thyme cover the bank from base to summit, and tufts of wild mignonette (*Reseda lutea*) revel in the chalky soil. Here also we find the snowy blossoms of the bladder campion (*Silene inflata*) and the purple-tufted vetch (*Vicia cracca*), together with the harebell and common mallow. An occasional group of scarlet poppies gives the finishing touch, by their brilliant hue, to a scene of much beauty.—(*Miss*) *Helen C. Brine, Westdean, Winchester.*

Proliferation in Rose-bloom.—The case figured on this page is from the garden at "Mona," Anerley, and from a photograph by J. H. Brown. The specimen flowered in the usual manner, shed its petals, and then the proliferation commenced, producing another flower from the point where the fruit ought to have grown in the ordinary course. This "sport" is not rare, and Dr. Maxwell T. Masters, in his "Vegetable Teratology," figures a rose bearing two flowers at the same time. He says: "Proliferous roses have a special interest, inasmuch as they show very conclusively that the so-called calyx-tube of these plants is merely a concave and inverted thalamus." We recently

Abnormal Growth of Rose.

recorded (*ante* p. 92) a similar case of proliferation in *Geum rivale*, in which species Dr. Masters gives instances of a like character.—*John T. Carrington.*

Albinism in Flowers.—There is a considerable quantity of the white bugle in a wood near Masbury Station on the Mendips, the only place where I have seen it. I have seen several plants not yet mentioned in the late lists in Science-Gossip with white flowers, viz., *Carduus crispen* L., *C. nutans* L., *Colchicum autumnale* L., *Saponaria officinalis* L., *Geranium pyrennicum* Burne fils, *Scilla probatis* Salisb. (pink as well as white). A pink specimen of the *Scilla* was sent me from the Castle Hill, Barnstaple, where, I was told, it is abundant. Of course, all plants bearing red, pink, blue or purple (= red, or pink + blue) flowers more or less frequently produce white flowers; though to know the reason would be of interest. Yellow and white are not often interchangeable, yet *Verbascum blattaria* L., is found with white flowers.—*A. E. Burr, Bath.*

NOTES & QUERIES

Phenology in Aberdeenshire.—The nature of any winter always more or less affects the flowering of plants in the following summer. Our last winter here was an exceeding mild one, and vegetation generally made an early commencement; but there was a very protracted cold rainfall at the beginning of May, just when many plants were in such position as to be easily affected by any exceptional weather conditions. The consequence was that there has been considerable confusion in so far as the various dates on which different species of plants have appeared in blossom; some being especially early, others about the usual time, and many decidedly later than usual. There is little to notice about the crowfoots (Ranunculaceae) and crucifers (Cruciferae). The rock-roses (*Helianthemum vulgare*) and violets (Violaceae) have flowered about the usual dates, but more meagrely than usual. Round-leaved sundew (*Drosera rotundifolia*) was rather early and prolific. Common milkwort (*Polygala vulgaris*) has shown more variation in the colour of its flowers than I have ever seen; the flowers being remarkable for the distinct divisions of colour. On the other hand, small upright St. John's-wort (*Hypericum pulchrum*) had weak plants. The various geraniums were about the average both in numbers and dates of flowering; the same might be said of whins (*Ulex*). Broom (*Spartium scoparium*) was very late: I have never known the foliage so prolific nor the perfume of the flowers so strong; but there seems only to be a limited number of seeds formed. The leguminous herbs seem to be generally up to about the average, if we except bird's-foot trefoil (*Lotus corniculatus*) which has a very heavy crop of seed-pods. Some other plants have had rather more brilliant flowers than usual. The indigenous roses have had brilliant and prolific bloom, and so had the wild cherry (*Prunus avium*) and the rowan or mountain-ash (*Pyrus aucuparia*). The willow-herbs (*Epilobium*) seemed weak. The Umbelliferae were about the average developments. The two-flowered Linnaea (*Linnaea borealis*) was later in flower than usual; and the same may be noted of the bedstraws (*Galium*). There was less attraction about the hawkweeds (Hieracii) and some others of the Compositae, such as the spear plume-thistle (*Cnicus lanceolatus*) the mountain everlasting (*Antennaria diorca*), than we are accustomed to. The exceptional lateness of such a precocious weed as common ragwort (*Senecio jacobaea*) is one of this year's features. The flowers of feverfew (*Pyrethrum involora*) were very brilliant. On the other hand the representation of hairbells (*Campanula rotundifolia*) was very meagre. The whortleberries (Vaccinaceae) were about the average crop. Although late, the blossom of the five-leaved heath (*Erica cinerea*) is the finest I have ever seen, some patches of moors being one gorgeous sheet of it, and the common ling (*Calluna vulgaris*), though also late, seems to have abundance of flowers upon its stems. The intermediate wintergreen (*Pyrola media*) is somewhat late, but has good flowers. The forget-me-nots (*Myositis*), growing either in water or sheltered places, were pretty fairly covered with bloom. There are fewer eyebrights (*Euphrasia officinalis*) than usual, while the large crop of foxglove (*Digitalis purpurea*) is another of the season's features. Fair plants of butterwort (*Pinguicula vulgaris*) were rare; while primroses (*Primula vulgaris*) could be had later than usual. The chickweed wintergreen (*Trientalis europaea*) took about its usual course. The buckwheats (Polygonaceae) had a poor display, but the docks *(Rumex)* were as usual. The willows (Salicaceae) had rich bloom. The orchids, though late, had fair blooms. The bog asphodel (*Narthecium ossifragum)* was not late, and had very rich flowers. The rushes (Juncaceae), sedges (Cyperaceae) and grasses (Graminaceae) had generally meagre development, and were comparatively late. Cultivated grasses varied much according to situation, showing the unusual strain placed on plant life through such a severe saturation with cold rain at a critical stage. Ferns were about an average, though the fronds were in many cases weak, and easily affected by weather.—*W. Wilson, Alford, Aberdeen; August*, 1898.

Helix nemoralis Eating Sand.—On August 25th, 1898, my eldest girl picked up a specimen of the above snail on the sea-shore below high-water mark, the tide having ebbed. Thinking it was an empty shell, it was washed, with others, to be boxed. Returning five hours after, in the evening of the same day, the animal had come out of its shell, eaten a rather large amount of the clean white blotting-paper on which it had lain to dry, and voided as excrement a considerable amount of beach sand. When blown on to the beach from the marram hills at Holkham, it must have "stayed its hunger" with sand.—*(Rev.) R. Ashington Bullen, F.G.S., Loughrigg, Somers Road, Reigate.*

Mollusca in Norfolk.—In the course of a half-hour's examination of the top of an old moss-grown wall on the Great Snoring Road just outside Walsingham, the following mollusca were found: *Helix aspersa, H. nemoralis, Hygromia rufescens* (abundant), *Clausilia bidens* (abundant), *Cochlicopa lubrica* (abundant), *Vallonia pulchella* (abundant), *Pyramidella rotundata, Hyalinia cellaria, H. nitidula, H. fulva, H. pura, Caecilianella acicula* (one), *Arion ater* (abundant), *Agriolimax agrestis* (two), *Carychium minimum, Pupa cylindracea, Acanthinula lamellata, Virtigo edentula*. The curious thing is that so many should occur on the top of a wall.—*(Rev.) R. Ashington Bullen, F.G.S.*

Unscientific Gossip.—The literature left by the landlords or landladies of seaside lodgings is not usually of the high order. However, some volumes of "Good Words" seemed promising, and an article therein has so amused me that your readers might share my mirth. It is on "Travellers' Snake Stories," written by Frederick Whymper, and from it I transcribe the following paragraphs. "The mungoose, a bird known as the kingfisher of Australia, and secretary bird of Africa, is well known in the West Indies almost always to come off victorious in its encounters with the rattlesnake. A correspondent of 'The Standard' has practically settled the question of poisonous snakes *v.* mungoose. During the earlier part of this winter's service in India he had believed that this bird was proof against even the poison of the cobra. He adds that these birds make affectionate pets, but have themselves a very strong liking for hens' eggs and young chickens." Let us hope that by this time (this volume of "Good Words" is for 1884) Mr. Whymper has seen a mungoose. When I was rowing at Oxford in 1866 I saw one in the bow of an eight on Procession Night. It was a pet of one of the oarsmen, but though I might have taken it for a tame pole-cat it certainly did not occur to me that it was a bird. The animal can always be seen at the Zoo, or bought at Jamrach's, and the most early and elementary knowledge of natural history might have saved Mr. Whymper from the various mistakes and ignorances he contrived to cram into a few lines, to wit: (1) the mungoose is a bird; (2) this bird is the same as the kingfisher of Australia; (3) and this kingfisher (probably the one known as the laughing jackass!) is the same as the secretary bird of Africa; (4) that this Australian bird is also common in the West Indies; (5) and even when domesticated commits ravages in poultry yards. Thus is natural history written and taught! —*(Rev.) J. W. Horsley, St. Peter's, Walworth.*

LOCALITIES OF TULIP AND MAIDENHAIR TREES. —There are three fine specimens of tulip-tree growing in the grounds of Adderley Hall, Shropshire, the property of Mr. H. R. Cabel.—*Athelstan Corbet, Adderley Rectory, Market Drayton.*

I have heard of three tulip-trees and seen two in Huntingdonshire. One is in the grounds of Bluntisham Rectory, near St. Ives. Another is growing at Houghton, near Huntingdon, where it was planted by Mr. G. W. Brown, and just now has plenty of flowers upon it, and is full of foliage. The third tree is in the garden of Mr. Burnaby, Brampton Manor, near Huntingdon; this is not very large, and I think has not yet flowered, although it looks healthy.—*John Ekins, 7, Grey Street, Bedford.*

There is a specimen of the tulip-tree in the garden of Northfield Rectory, Worcestershire; also a very fine specimen at Enville Hall, Lady Stamford's Staffordshire seat.—*(Rev.) K. A. Deakin, Cofton Hackett.*

Since sending my last note I have found another habitat for tulip-tree, viz., a garden in the St. Cross Road, Winchester. The tree, a small one, can be well observed from the pavement.—*Helen C. Brine, Winchester.*

In the grounds of Glazenwood, situate in the parish of Bradwell-juxta-Coggeshall, which were planted about 1805 by Mr. Samuel Curtis, of "Botanical Magazine" fame, and for some years after said to contain the finest orchards in the kingdom, but now, alas, in the last stages of decay, there is still a tulip-tree and a maidenhair tree, which, I should say, were either planted by the illustrious forerunner of our coloured botanical literature, or at his instigation. The connection of these trees with Mr. Curtis seems to add additional interest to this record. There are also two tulip-trees in the grounds of Bulford Mill, near Braintree. —*Edwin E. Turner, Coggeshall, Essex.*

THE FEMALE OF THE MAIDENHAIR TREE.—In thanking readers who have been good enough to furnish localities of the maidenhair tree *(Gingko biloba* or *Salisburia adiantifolia)* and the tulip-tree *(Liriodendron tulipifera)*, may I ask further, whether any of the former have been noticed to bear female flowers, or whether all those quoted bear only the sessile yellowish-looking flowers of the male. The female is said not to be existent in this country. At present localities of the former and of the latter that have been mentioned are not a very large number, it must be confessed.—*E. A. Martin, Thornton Heath.*

AGRIOLIMAX LAEVIS, NEW VARIETY.—I have recently collected on Barnes Common, Surrey, a variety of *Agriolimax laevis* Müll., which has not, I believe, been recorded. It occurs sparingly on a piece of very marshy ground at the northern extremity of the common, which locality is also the original spot where Professor Cockerell collected the type specimens of his var. *maculatus* of this species, described in 1886. I have searched here diligently for that form, but without success, and I have never seen a specimen; but think my new variety must be a very close relation. It attains a size equal to that of the typical form, which it much resembles in colour, occasionally assuming a somewhat darker shade, deepening in tone towards the posterior. The mantle, however, is very minutely mottled with rich dark red-brown, the colour being denser and more closely set on the centre and anterior portions. The sides in some examples are almost without trace of the mottling. I am unable to speak definitely as to its anatomy, not having secured sufficient material to make a critical examination. The shell is small and does not attain the same dimensions as that found in individuals of the typical form of equal size. This variety favours a very aquatic habitat; all my examples having occurred on the stems of sedges and rushes growing in dense masses in water several inches deep. The type also occurs at Barnes, but is never associated with this variety, preferring the shelter afforded by the dead leaves which have accumulated in damp, shady hollows. — *Geo. E. Mason, 11b, Stanford Place, Stanley Bridge, Fulham, S.W.*

SPEED OF FLYING BIRDS.—Can any of your readers give, approximately of course, the rate of speed during flight of the swift? I once saw it stated in a leading article in "The Standard," I think, as being 290 miles an hour, and have actually heard it maintained since; which is absurd. Probably the figures would be tolerably accurate without the first figure, viz., ninety miles per hour, which is what I have always understood till astounded by the statement in "The Standard."—*A. E. Burr, Bath.*

YORKSHIRE FUNGUS FORAY.—The members of the Mycological Section of the Yorkshire Naturalists' Union held their annual fungus foray on September 10th and 12th. The place selected for investigation this season was the charming district of Harewood, Leeds. East Keswick was chosen as a centre. A considerable amount of success attended the work, although the dryness of the weather during the previous weeks had been unfavourable. Excellent results were, however, attained with the smaller species; these were mostly microscopic. During the two excursion days and the preceding week-end 300 species, great and small, were found and identified. On the last evening of the foray the Rev. W. Fowler, Vicar of Liversedge, Yorks, read a most interesting paper on "The Popular Aspects of Mycology." The rev. gentleman gave most excellent advice and encouragement to students and would-be students concerning the vast importance of the subject, not only from a purely scientific, but also from an economic point of view. This branch of botany holds out a promising field to young and persevering students. The fungus-flora of Great Britain is far from being worked out. The life-histories of many species which so insidiously attack both wild and cultivated plants are waiting to be investigated, while numberless other species are to be sought and described. — *Chas. Crossland, Hon. Sec. Yorkshire N.U. (Mycology), 4, Coleridge Street, Halifax.*

GEOLOGY

CONDUCTED BY EDWARD A MARTIN, F.G.S.

To whom all Notes, Articles and material relating to Geology, and intended for SCIENCE-GOSSIP, *are, in the first instance, to be addressed, at* 69, *Bensham Manor Road, Thornton Heath.*

FOREIGN STONES IN THE CHALK. — Mantell speaks in his "Isle of Wight" of having discovered in 1822, in the chalk marl near Lewes, "fragments of green chlorite schist."

GEOLOGY OF BOURNEMOUTH.—A memoir of the geology of the country around Bournemouth has been issued by the Geological Survey in explanation of the new series map of the neighbourhood. It is illustrated by some of the characteristic fossils of the district.

GEOLOGY OF IRELAND.—We have received an interesting catalogue of "Geological Irish Views" from Mr. R. Welch, of Lonsdale Street, Belfast, Ireland. Mr. Welch's views in his "Geological Series" are well-known for their excellence and for their representative selection, as he is an expert in the subject, as well as having the advice of the leading Irish geologists.

"THE THEORY OF THE EARTH".—The Geological Society of London has decided to publish part of the third volume of Hutton's "Theory of the Earth," at a cost not exceeding £80. The manuscript is in the Society's possession, and Sir Archibald Geikie, who urged the desirability of its publication, has offered to edit the manuscript. One thousand copies are to be produced in a style uniform with the first and second volumes.

NORWOOD AND CROYDON NOTES.—Recent excavations which have taken place for sewering purposes in Thornton Heath have opened up numerous sections of Tertiary Beds. The section from north to south across the recreation ground showed the gradual rise of the Woolwich Beds, which continued along the Carew Road, Beulah Road East and Boswell Road, where specimens of *Ostrea* were plentiful within 4 feet of the surface, the superincumbent beds being post-tertiary gravel and sand. The gravel thickens westward, giving rise to some of the well-known Croydon gravel pits, but the tertiaries again appear at Waddon, only to disappear before reaching Cold Harbour Farm, as shown by the new bore-hole, where chalk was pierced into at once. East from the Thornton Heath Recreation Ground and approaching the Norwood Hills, a pit of Oldhaven grey sand was opened up when the houses in the Stewart Road were built. This is close to the railway station. In the cellar discovered beneath the recently demolished Collier's Water Farm, the same sand was seen to a depth of five feet, beneath three feet of loam. On the top of the hill from the Crystal Palace to South Norwood Hill, angular gravel in a ruddy, sandy matrix, appears to be continuous the whole of the way, as shown by numerous excavations made in the road and seen by me. It is not so partial as marked on the Survey maps.

EARTH HEAT.—According to Sir William Thomson the general climate of our globe could not have been sensibly affected by internal heat at any time more than 10,000 years after the commencement of the solidification of the surface. Present internal heat influences temperature only to about one seventy-fifth of a degree.

GEOLOGICAL SPECIMENS.—A catalogue from Mr. T. D. Russell, of 78, Newgate Street, E.C., is enough to make the collector's "mouth water." Special collections are arranged to illustrate "Earth Knowledge," Geikie's "Class-Book," Judd's "Student's Lyell," Rutley's "Mineralogy," etc.; also type series for prospectors. The collections of fossils range in extent from seventy to 1,200 specimens. We notice that Mr. Russell has for sale a fine collection of Trilobites from the Upper Silurian of Dudley.

GEOLOGICAL NOMENCLATURE.—When William Smith issued his geological map in 1815, such names as London Clay, Kentish Rag, Cornbrash, Lias, Forest Marble, passed into accepted geological nomenclature. Smith's education was that of the village school, and such as he also gave himself. Hence, as Sir Archibald Geikie says, he did not invent euphonious terms from Greek or Latin roots, but was content to take the rustic or provincial names in common use over the districts he traversed. This is now a distinct advantage to young students in geology, who find in the names of the formations they examine reminiscences of the districts visited. The question of abolishing such names as Chalk, Gault, etc., and to substitute geographical names only, which was brought before the International Geological Congress, is not likely, I am convinced, to receive much support from English geologists. Such local names are too firmly rooted in our geological literature to be abolished by resolution.

GLACIAL DEPOSITS. — When considering the claims of the two schools of glacialists to be the exponents of the true theory of the deposition of boulder clay, it is as well to remember that Sir Henry Howarth claims to see in the action of vast floodings of water on a wide scale the true origin of the drift. He claims that the theory of ice-sheets is directly at issue with the known physical qualities of ice. Geological evidence points to the former occurrence of local glaciers on a large scale, but the phenomena to be explained are attributable to the widespread action of water subsequently to the existence of the great glaciers. Glaciers themselves will not explain the existence of the drift, spread out, as it is, not as moraines, but in continuous sheets. They cannot explain the separation of the drift into beds of gravel, sand and clay, the known débris of glaciers being mixed and heterogeneous; nor do they explain the existence of marine shells in glacial beds, nor the moving of boulders and erratics from lower to higher levels. The action of water on a wide scale is alone capable of giving a satisfactory explanation. On the other hand, there are many geologists at the present day who see in the action of now existing glaciers all that is necessary to explain the existence of what they believe to be these old-time moraines. It must be admitted, however, that the explanation of the existence of marine shells on Moel Tryfaen, etc., by imagining them to have been pushed there by ice without any submergence of the land at all, is extremely far-fetched.

TRANSACTIONS

THE SOUTH LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY. — September 8th, Mr. J. W. Tutt, F.E.S., President, in the chair. Mr. Little, 17, Belgrave Street, King's Cross, was elected a member. Mr. F. Clarke exhibited some very admirable photographs of the eggs of Lepidoptera sent to him by the President. They included those of *Erebia embla*, *Chionobas jutta*, *Polyommatus bellargus*, *P. icarus*, *Gonepteryx rhamni* and *Spilosoma menthastri*. Mr. Edwards, specimens of *Abraxas ulmata* vars. from York. It was stated that neither on the present occasion nor when the var. was taken years ago did the ova produce dark imagines like the parents. Mr. West, specimens of *Forficula lesnei* from Box Hill and Reigate, at both of which places it was common. Mr. Lucas, a series of the local grasshopper, *Mecastethus grossus*, from the New Forest, where it had this year occurred in some numbers. He kindly presented a pair to the Society's collections. Mr. R. Adkin, a series of *Smerinthus tiliae*, and remarked on the variation to be seen in the central band. Mr. Turner, a yellow variety of *Callimorpha dominula*, bred from a Deal larva this year; bred specimens of *Myelois cribrella* from Benfleet, where the larvae were most abundant; a bred example of *A. grossulariata* from Camberwell, having the space internal to the marginal spots of a brownish tinge, the rest of the wing surfaces being normal; and a series of *Aglais urtica*, bred from larvae taken at Box Hill, and fed up in a greenhouse, having the usually large black blotch on the inner margin of the forewings either entirely absent or represented by a few black scales. Mr. Dennis, specimens of the filmy fern (*Hymenophyllum wilsoni*) from Wales, where it is found in somewhat exposed situations. Mr. Moore, a series of blue females of *Polyommatus icarus* from Folkestone, which were well marked. Mr. Mansbridge, a series of undersides of the female of *Plebius aegon*, selected to show the ordinary range of variation in the species as it occurs in St. Leonard's Forest. Mr. Montgomery, an exceedingly fine dark suffused male aberration of *Dryas paphia*, one of two bred from ova. Mr. Ashby, a tiny aberration of *P. corydon* from Riddlesdown, and a female of *P. aegon* from Oxshott, showing blue splashes. Mr. Bishop, a beautiful bred series of *Geometra vernaria* from Guildford. During the summer the Society's rooms have been redecorated and the electric light introduced.—*Hy. J. Turner* (*Hon. Report. Sec.*)

LEICESTER LITERARY AND PHILOSOPHICAL SOCIETY.—Section D (Biology) held its monthly meeting on Wednesday evening, July 20th, in the New Council Chamber, Princess Street. Mr. G. Creswell Turner in the chair. There were several exhibits, including the greater spear-wort by Mr. Jackson, who had found it growing in the neighbourhood of Leicester. Some paper string, by Mr. Turner, who rather doubted the durability of it, at the same time owning that perhaps much paper, looked upon as waste, might be utilized in this manufacture. Mr. Bell showed some abnormal forms of ash leaves found growing in his own garden at Knighton. Mrs. Clarke-Nuttall, B.Sc., read a paper on "Electro-Horticulture," or the results of plants grown by electric light. The paper showed that this artificial light is in some cases a valuable auxiliary to market gardeners; notably in the growing of lettuces; it further described some modifications of plant structure which were induced by this means. A short discussion followed; but much has yet to be discovered to make it a perfect success.—*J. M. Read, Hon. Sec.*

GREENOCK NATURAL HISTORY SOCIETY.—On August 13th the members of this society had an excursion to Bute. The party after reaching Rothesay took coach to Kilchattan Bay, under the leadership of Mr. J. Ballantyne of Rothesay. The chief object of this visit was of an archaeological nature. The party made its way to St. Blane's historic chapel. The first subject for their examination was what is popularly known as "The Deil's Cauldron," regarding the use of which there are various theories, one of them being that it was used as a place of penance. The chapel was next visited. Particular attention was paid to the restorations and the beautiful chancel arch in the wall which divides the nave from the chancel. This arch is said to be one of the most lovely of which our country can boast. St. Blane's tomb close beside the south chancel wall was also noticed. For its better preservation the Marquis of Bute had a bronze casing put over it in 1874. The double graveyard was also examined—the higher one next the church being reserved for men, and the lower or inferior one for women, because, as a legend says, a woman had refused to assist St. Blane when carrying holy earth from the shore to the graveyard, which had been brought by him from Rome. After various other things of interest had been examined, the party returned to Kilchattan Bay, where a short time was spent in examining some of the botanical and other natural history objects to be found there. Amongst them may be mentioned the sea raddish (*Raphanus maritimus*), one of our local British plants. The sea holly, which used to grow here in abundance fifteen to twenty years ago, is now about extinct, owing to visitors pulling it up and taking it away. The return journey to Rothesay was by way of Mountstuart, and when passing Ascog Bay a most interesting view was obtained of several solan geese, which were busy fishing here quite close to the shore. Although this bird is plentiful about Ailsa Craig it is seldom seen so far up the firth.—*G. W. Niven, Hon. Sec., 23, Newton Street, Greenock.*

CITY OF LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY.—August 16th, 1898.—Exhibits: Mr. J. A. Clark, a series of *Cidaria sagittata* bred from larvae taken at Wicken. Dr. J. S. Sequeira, who had spent the first three weeks of July at Margate, showed a box of captures including banded forms of *Camptogramma bilineata*, *Acronycta aceris*—a long series taken at sugar—a single *Asthena luteata*, *Neuria reticulata* (*sapponariae*), and *Cossus ligniperda* taken at sugar. He also exhibited a heavy piece of Australian Kauri pine, which, when split, disclosed a dead immature longicorn beetle in a cell a little larger than itself, no communication was discernible from the outside. Mr. C. Nicholson, two pupae of *Saturnia pavonia* in one cocoon from Weybridge.—*H. A. Sauzé, Hon. Sec.*

NOTICES OF SOCIETIES.

*Ordinary meetings are marked †, excursions *; names of persons following excursions are of Conductors.*

NORTH LONDON NATURAL HISTORY SOCIETY.

Oct. 6.—†Pocket Box Exhibition.
,, 20.—†"Buttercups and their Allies; or, the Teachings of Systematic Botany as to Evolution." Prof. G. S. Boulger.
,, 22.—*Visit to the Epping Forest Museum. Wm. Cole (Curator of the Museum).
Nov. 3.—†"Henry Walter Bates: his Life and Work." L. B. Prout, F.E.S.
,, 17.—†Discussion: "The Origin of Migration in Animals." Opened by J. A. Simes.

Visitors will be cordially welcomed at all meetings and excursions. *Lawrence J. Tremayne, Hon. Sec.*

LINCOLNSHIRE SCIENCE SOCIETY.

Oct. 8.—*Torksey: Old Trent gravels. W. E. Asquith.
Hon. Sec., G. A. Grierson, F.L.S., 312, High Street, Lincoln.

NOTTINGHAM NATURAL SCIENCE RAMBLING CLUB.

Oct. 29.—†Annual Meeting and Exhibition, 4.15 p.m., Natural Science Laboratory, University College.
Hon. Sec., W. Bickerton, 187, Noel Street.

METROPOLITAN SCIENTIFIC SOCIETIES.

The following is a list of societies in the London district devoted to natural science, with hours and places of meeting. They may be visited with introduction from a Fellow, Member, or Secretary. Will secretaries send additions or corrections.

ANTHROPOLOGICAL INSTITUTE OF GREAT BRITAIN, 3, Hanover Square. Second and fourth Tuesdays at 8.30 p.m., November to June.

BATTERSEA FIELD CLUB AND LITERARY AND SCIENTIFIC SOCIETY. Public Library, Lavender Hill, S.W. Thursdays, 8 p.m.

CITY OF LONDON COLLEGE SCIENCE SOCIETY, White Street, Moorfields, E.C. Last Wednesday in each month, October to May, 7.30 p.m.

CITY OF LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY, London Institution, Finsbury Circus. First and third Tuesdays, 7.30 p.m.

CONCHOLOGICAL SOCIETY, LONDON BRANCH, St. Peter's Rectory, Walworth. Irregular meetings. Rev. J. W. Horsley, President, will answer enquiries.

CROYDON MICROSCOPICAL AND NATURAL HISTORY CLUB, Public Hall. Third Tuesdays, October to May, 8 p.m.

DULWICH SCIENTIFIC AND LITERARY ASSOCIATION. Fortnightly lectures Lordship Lane Hall, second and fourth Mondays, 8.15 p.m., from October, for winter season.

EALING NATURAL SCIENCE AND MICROSCOPICAL SOCIETY. Victoria Hall, Ealing. Second and last Saturdays. October to May, 8 p.m.

ENTOMOLOGICAL SOCIETY, 11, Chandos Street, Cavendish Square. First Wednesday, October to June (except January). Third Wednesday, January, February, March and November, 8 p.m.

GEOLOGISTS' ASSOCIATION, University College, Gower Street. First Friday, 8 p.m., November to July.

GEOLOGICAL SOCIETY OF LONDON, Burlington House, Piccadilly. First and third Wednesdays, 8 p.m., November to June.

GREENHITHE NATURALISTS' AND ARCHÆOLOGICAL SOCIETY, 7, The Terrace. First Fridays, 7 p.m.

LAMBETH FIELD CLUB AND SCIENTIFIC SOCIETY, St. Mary Newington Schools, Newington Butts, S.E. First Mondays all the year and third Mondays in winter, 8 p.m.

LINNEAN SOCIETY OF LONDON, Burlington House, Piccadilly. First and third Thursdays at 8 p.m., November to June.

LONDON AMATEUR SCIENTIFIC SOCIETY, Memorial Hall, Farringdon Street, E.C. Fourth Friday in each month, October to May, 7.30 p.m.

LUBBOCK FIELD CLUB. Working Men's College, Great Ormond Street, Bloomsbury, W.C. Excursions second Sundays, Meetings following Mondays, 8 pm.

MALACOLOGICAL SOCIETY OF LONDON, meets in Linnean Society's Rooms, Burlington House. Second Friday each month, November to June, 8 p.m.

MINERALOGICAL SOCIETY. Meets in rooms of Geological Society, February 4th, April 14th, June 23rd, November 17th, 8 p.m.

NONPAREIL ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY, 99, Mansfield Street, Kingsland Road, N.E. First and third Thursdays, 8 p.m.

NORTH KENT NATURAL HISTORY AND SCIENTIFIC SOCIETY. St. John's Schools, Wellington Street, Woolwich. Alternate Wednesdays, 7.30 p.m.

NORTH LONDON NATURAL HISTORY SOCIETY, North-East London Institution, Hackney Downs Station. First and third Thursdays, 7.45 p.m.

QUEKETT MICROSCOPICAL CLUB, 20, Hanover Square. First and third Fridays, 8 p.m.

ROYAL BOTANIC SOCIETY OF LONDON, Regent's Park Second and fourth Saturdays at 3.45 p.m.

ROYAL HORTICULTURAL SOCIETY, 117, Victoria Street, S.W. Second and fourth Tuesdays, except December to February; 2 p.m. on show days, which vary.

ROYAL METEOROLOGICAL SOCIETY, 22, Great George Street, Westminster. 3rd Wednesday, November to June, 8 p.m.

ROYAL MICROSCOPICAL SOCIETY, 20, Hanover Square. Third Wednesdays, October to June, 8 p.m.

SELBORNE SOCIETY, 20, Hanover Square. No winter meetings.

SIDCUP LITERARY AND SCIENTIFIC SOCIETY, Public Hall Sidcup. First and third Tuesdays, October to May, 8 p.m.

SOUTH LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY, Hibernia Chambers, London Bridge, S.E. Second and fourth Thursdays, 8 p.m.

SUTTON SCIENTIFIC AND LITERARY SOCIETY, Public Hall Chambers. Second and forth Tuesdays, 8 p.m.

WEST KENT NATURAL HISTORY, MICROSCOPICAL AND PHOTOGRAPHIC SOCIETY. Meets in School for Sons of Missionaries, Blackheath, third Wednesday, in December, fourth Wednesdays in October, November, January February, March, April, May, 8 p.m.

ZOOLOGICAL SOCIETY OF LONDON, 3, Hanover Square. First and third Tuesdays, 8.30 p.m., November to August.

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—SCIENCE-GOSSIP is published on the 25th of each month. All notes or other communications should reach us not later than the 18th of the month for insertion in the following number. No communications can be inserted or noticed without full name and address of writer. Notices of changes of address admitted free.

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NOTICE.—Contributors are requested to strictly observe the following rules. All contributions must be *clearly* written on one side of the paper only. Words intended to be printed in *italics* should be marked under with a single line. Generic names must be given in full, excepting where used immediately before. Capitals may only be used for generic, and not specific names. Scientific names and names of places to be written in round hand.

THE Editor will be pleased to answer questions and name specimens through the Correspondence column of the magazine. Specimens, in good condition, of not more than three species to be sent at one time, *carriage paid*. Duplicates only to be sent, which will not be returned. The specimens must have identifying numbers attached, together with locality, date and particulars of capture.

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MICRO-MOUNTING CABINET, containing stains, bottles, slides, etc., for exchange. Wanted, micro accessories, low-power objective and triple nose-piece.—O. T. Elliott, 99, Melton Road, Leicester.

WHAT offers for 27 parts of "Don Quixote," by Cervantes, illustrated by Gustave Doré; publishers, Cassell and Co.—A. Nicholson, Carlton House, Greenbank Road, Darlington.

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KERNER AND OLIVER'S "Natural History of Plants," parts 8, 9, 10, new. What offers?—Rev. C. H. Waddell, Saintfield, co. Down.

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